EAST ANGLIAN ARCHAEOLOGY

Frontispiece:
Test pit grid at the Snail channel, Isleham

dedicated to Norma Challands

A Line Across Land: Fieldwork on the Isleham–Ely pipeline, 1993–4

by Kasia Gdaniec, Mark Edmonds and Patricia Wiltshire

with contributions from
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East Anglian Archaeology
Report No. 121, 2007

Cambridge Archaeological Unit

EAST ANGLIAN ARCHAEOLOGY
REPORT NO.121

Published by
Cambridge Archaeological Unit
Department of Archaeology
University of Cambridge
Downing Street
Cambridge CB2 3DZ

in conjunction with
ALGAO East
www.algao.org.uk/cttees/regions

Editor: Adrian Tindall
Managing Editor: Jenny Glazebrook

Set in Times Roman by World Tree using Adobe InDesign™
Printed by Henry Ling Limited, The Dorset Press

ISBN 978 0 9544824 5 9

East Anglian Archaeology was established in 1975 by the Scole Committee for Archaeology in East Anglia. The scope of the series expanded to include all six eastern counties and responsibility for publication was transferred in 2002 to the Association of Local Government Archaeological Officers, East of England (ALGAO East).

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Cover illustration
Test pit grid at the Snail channel, Isleham. *Photo: Kasia Gdaniec*

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Acknowledgements

Anglian Water funded all stages of pipeline-related fieldwork and analysis; English Heritage funded a small programme of enhancement fieldwork around the Snail channel. Bob Sydes, then of Cambridgeshire County Council, provided overall development control while Margaret Cox, Janet Miller and Gerry Wait for Gifford and Partners, were archaeological consultants to Anglian Water. Particular thanks are extended to Anglian Water's Mr Alan Baxter and Mr S. Jegatheesan, the principal engineer for the pipeline, for supporting the CAU's archaeological design. Mr Maxwell of Moor Farm, Fordham and Mr Skeels of Chalk Farm, Isleham, provided generous access to their land for the enhancement fieldwork and valuable assistance with grounded vehicles and other hazards during that saturated winter. Mr Clarke of Clarke Farms, Isleham, has most generously donated the miniature Isleham bow to the Museum of Archaeology and Anthropology, Cambridge University.

Thanks are due to David Hall for valuable discussion and for allowing the use of fig. 41 from his 1996 South-East Fenlands volume. Patricia Wiltshire is grateful to Dr J.A. Webb and Mr I. Dormer for excellent technical assistance and to Mr P.L. Murphy for obtaining the samples. Many colleagues at the Cambridge Archaeological Unit assisted at various times with this project and provided the necessary humour and staying power during the wettest months of the cold 1993/4 winter. Among these, heartfelt gratitude must go to anyone who had anything to do with the burnt flint assemblage, both in the field and subsequently: Norma Challands, Danny Hind and Lesley MacFadyen, Helen Lewis and David Gibson. Illustrations for this volume are the work of Crane Begg, Brian Crossan, Andrew Hall, Vicky Herring, Jane Matthews and Ruth Parkin. Mark White prepared the flint catalogue. Gwil Owen, David Edwards and Tristram Dodwell provided the photographs of the bow, cut antler shaft and stone-worker's flints respectively. Thanks also to Chris Evans, who provided much support and spent long hours in discussion about method and meaning and fenland issues generally.

Summary

Investigation of the construction corridor of a water supply pipeline between Isleham village (TL 6412/7303) and Ely (TL 5397/7964), Cambridgeshire, during 1993–4 provided an opportunity to sample the prehistoric landscape along a transect that crossed several major geological boundaries. This narrow window ran from the Lower Chalk of the ancient peninsula of Isleham, across the heavy low-lying clays of Soham and down into the peat fen of Stuntney and south-east Ely. Within the constraints set by the development, field investigation and subsequent analysis were conducted at several scales. In the initial stage, attention focused on predicted occupation areas (principally at the fen margins), while the intervening landscape — between these areas and known sites — was sampled. Along with palaeoenvironmental data, samples of flint, burnt flint and other materials provided a context within which to explore specific models for interpreting the character of later prehistoric landscape occupation across a diverse set of conditions.

As a consequence of landscape sampling, six significant site areas were designated for archaeological mitigation ahead of construction. These were located at the neck of the sand and chalk peninsula of Isleham, extending down its gradually sloping western edge towards the braided palaeochannels of the River Snail. This occupation-rich zone on the chalk contrasted sharply with areas of the fen that showed little evidence of early occupation where crossed by the pipeline. Two of these sites also saw a programme of enhanced and more extensive fieldwork funded by English Heritage, and these form the main body of the report.

These different scales and intensities of work in the field are reflected in the structure of the report. The extensive survey and evaluation is dealt with in the first substantive chapter (Chapter 2) and provides a full record of work conducted along the length of the pipeline corridor. Chapter 3 documents the more limited investigations conducted at four of the site areas identified in stage 1. The core of the volume lies in Chapters 4 and 5, which deal with the more substantive records arising from work at Prickwillow Road and around the palaeochannels of the River Snail. Dominated by Early Bronze Age and Earlier Neolithic material respectively, these 'sites' add a significant body of information to our understanding of the later prehistoric sequence in the area, data which are set in broader context in Chapter 6.

Résumé

La construction d'un pipeline d'approvisionnement en eau entre le village d'Isleham (TL 6412/7303) et celui d'Ely (TL 5397/7964) dans le Cambridgeshire au cours des années 1993 et 94 a permis de constituer un échantillon du paysage préhistorique le long d'un transect traversant plusieurs grandes frontières géologiques. Cette étroite fenêtre partait de la Craie inférieure de l'ancienne péninsule d'Isleham, puis traversait les argiles lourdes en contrebas de Soham avant d'atteindre la tourbe des marécages de Stuntney et du sud-est d'Ely. En raison des contraintes liées au développement des travaux, les recherches sur le terrain et l'analyse qui en a résulté furent menées sur plusieurs plans. Pendant la phase initiale, l'attention s'est portée sur les zones d'occupation prévisibles (principalement aux limites des marécages) tandis que des échantillons étaient tirés du paysage intermédiaire situé entre ces zones et les sites connus. Des échantillons de différents matériaux (comme des silex ou des silex brûlés) et des données paléoenvironnementales ont fourni un contexte qui a servi de cadre à l'exploration de modèles précis. Ces derniers ont permis d'interpréter les caractéristiques d'une occupation de paysage préhistorique plus tardive selon un ensemble de conditions diversifiées.

L'échantillonnage du paysage a débouché sur la sélection de six sites importants qui furent soumis à des mesures d'atténuation de l'impact archéologique avant le début des travaux. Ces sites se trouvaient sur la langue de sable et de craie de la péninsule d'Isleham, dont la partie ouest descend doucement vers les paléo-canaux en tresses de la River Snail. Cette zone de craie où l'occupation était importante s'opposait fortement aux zones de marécages qui présentaient peu de traces d'une occupation précoce aux endroits traversés par le pipeline. Deux de ces sites furent également l'objet d'un travail sur le terrain plus approfondi et plus étendu qui fut financé par l'English Heritage et qui constitue l'essentiel du rapport.

Les différences d'échelle et de profondeur du travail sur le terrain se reflètent dans la structure du rapport. Le chapitre 2, qui constitue le premier chapitre important, traite des relevés minutieux et de l'évaluation des recherches et présente un compte-rendu complet des travaux menés le long du couloir tracé par le pipeline. Le chapitre 3 présente les recherches plus limitées qui ont été menées sur quatre des zones de site identifiées lors de la phase 1. L'essentiel du volume réside dans les chapitres 4 et 5 qui traitent des découvertes plus importantes résultant du travail mené à Prickwillow Road et autour des paléo-canaux de la River Snail. Dominés par des matériaux datant respectivement du début de l'âge du bronze et du début du néolithique, ces « sites » contribuent de façon significative à notre compréhension de la période préhistorique tardive dans cette zone, ces données étant présentées dans un contexte plus large au niveau du chapitre 6.

(Traduction: Didier Don)

Zusammenfassung

Bei der Untersuchung des Baukorridors für eine Wasserversorgungsleitung zwischen Isleham (TL 6412/7303) und Ely (TL 5397/7964), Cambridgeshire, bot sich in den Jahren 1993 und 1994 die Gelegenheit, die prähistorische Landschaft entlang eines Transekts, der mehrere wichtige geologische Grenzen kreuzte, stichprobenartig zu erforschen. Dieses schmale Fenster erstreckte sich von der Unteren Kreide der vormaligen Halbinsel Isleham über die schweren, tief liegenden Tone von Soham bis hinunter in das Niedermoor bei Stuntney südöstlich von Ely. Das Ausmaß von Felduntersuchung und anschließender Analyse variierte in Abhängigkeit von den entwicklungsbedingten Einschränkungen. Während die zwischen diesen Bereichen und bereits bekannten Stätten liegende Landschaft stichprobenartig untersucht wurde, lag das Hauptaugenmerk in der Anfangsphase auf vermuteten Siedlungsgebieten (vornehmlich an den Rändern des Niedermoors). Angaben über die Paläoumwelt sowie Funde von Flintstein, gebranntem Feuerstein und anderen Materialien lieferten einen Kontext, in dem anhand konkreter Modelle erforscht wurde, welche Merkmale die spätere Besiedelung prähistorischer Landschaften unter verschiedenen Bedingungen kennzeichneten.

Im Rahmen der stichprobenartigen Untersuchungen des Geländes wurden vor Beginn der Baumaßnahmen sechs relevante Grabungsgebiete für die archäologische Erfassung festgelegt. Sie lagen am Hals der Sand- und Kreidehalbinsel Isleham, wo sie sich an deren sanft abfallendem Westrand bis hinunter zum verzweigten urzeitlichen Bett des River Snail hinzogen. Diese dicht besiedelte Zone über der Kreide bildete einen starken Gegensatz zu den Niedermoorregionen, die dort, wo die Wasserleitung sie kreuzte, nur wenige Anzeichen einer frühen Besiedelung zeigten. An zwei der sechs Stätten wurden im Rahmen eines von English Heritage finanzierten Programms besonders umfangreiche Felduntersuchungen durchgeführt. Ihnen ist der größte Teil dieses Berichts gewidmet.

Die Unterschiede bei Ausmaß und Intensität der Feldforschungen schlagen sich auch im Aufbau des Berichtes nieder. Die ausgedehnte Prospektion und Vorauswertung wird im ersten größeren Kapitel (Kapitel 2) abgehandelt, das sämtliche entlang des Leitungsgrabens durchgeführten Arbeiten in vollem Umfang aufzeichnet. Kapitel 3 dokumentiert die begrenzteren Untersuchungen in vier der in Phase 1 identifizierten Geländebereichen. Das Kernstück des Bandes bilden die Kapitel 4 und 5, die sich mit den substanzielleren Befunden befassen, die durch die Arbeiten an der Prickwillow Road und rund um die Paläokanäle des River Snail zutage traten. Diese von frühbronzezeitlichem bzw. neolithischem Material dominierten »Stätten« fügen unserem Wissen über die spätprähistorischen Abläufe in dem Gebiet wichtiges neues Datenmaterial hinzu. Diese Daten werden in Kapitel 6 in einem breiteren Kontext dargestellt.

(Übersetzung: Gerlinde Krug)

1. Introduction

The south-eastern Cambridgeshire fenland is well-known for its remarkable density of later prehistoric sites on islands and peninsulas of relatively high ground above the fen basin. A function of the increasing intensity of drainage and cultivation, many of these sites appear as surface scatters of materials exposed by erosion or liberated from buried soils and cut features by the plough. Though many still lie buried beneath marine alluvium or peat, the pace of erosion has been such that surface scatters were by far the most common site category identified during the Fenland Management Project (Hall and Coles 1994). A number of these scatters have received close attention in the field; investigated to take apart palimpsests or to explore their relation to sub-surface remains and broader 'backgrounds'. Reflecting wider trends, much of this work has also been informed by explicit landscape perspectives. Beyond basic questions of survival and visibility, attention has turned to landscape patterning, and to how, if at all, these 'sites with one dimension missing' (Bradley 1987) might contribute to our understanding of past traditions of landscape occupation (Edmonds *et al.* 1999, Healy 1996, Malim 1990). In the area encompassed by the Fenland Survey, this has encouraged an explicit concern with sampling and attempts to integrate the results of surface survey with local and broader palaeoenvironmental sequences (Boast and Evans 1991, Hall and Coles 1994, Waller 1994a).

Undertaken more than a decade ago, the fieldwork reported upon here took place against a variety of backgrounds. Occasioned by the development of a new water pipeline, it involved the close investigation of a narrow 'corridor' between Isleham and Ely (TL 6412/7303–TL 5397/7964), a line that took in a range of ecologies and some of the more renowned areas investigated by the Fenland Survey (Fig. 1). Long known for its Bronze Age metalwork and barrow distributions, fieldwalking in the environs of Isleham had highlighted remarkable densities of lithic scatters (*e.g.* Hall 1996; Healy 1996). Indeed, the opinion was often heard at the time that it was 'the only landscape in Eastern England to rival Wessex'. A number of projects had been proposed previously, but since none of these had come to fruition, the pipeline investigation was one of the first serious attempts to tackle the archaeology of the area at any scale. As a pipeline project, there were the inevitable drawbacks common to all 'linear' investigations. These, however, were tempered by the opportunity that the development offered to track variability in the character and density of prehistoric material across various geologies/topographies. Within the Isleham area itself, we were also fortunate enough to

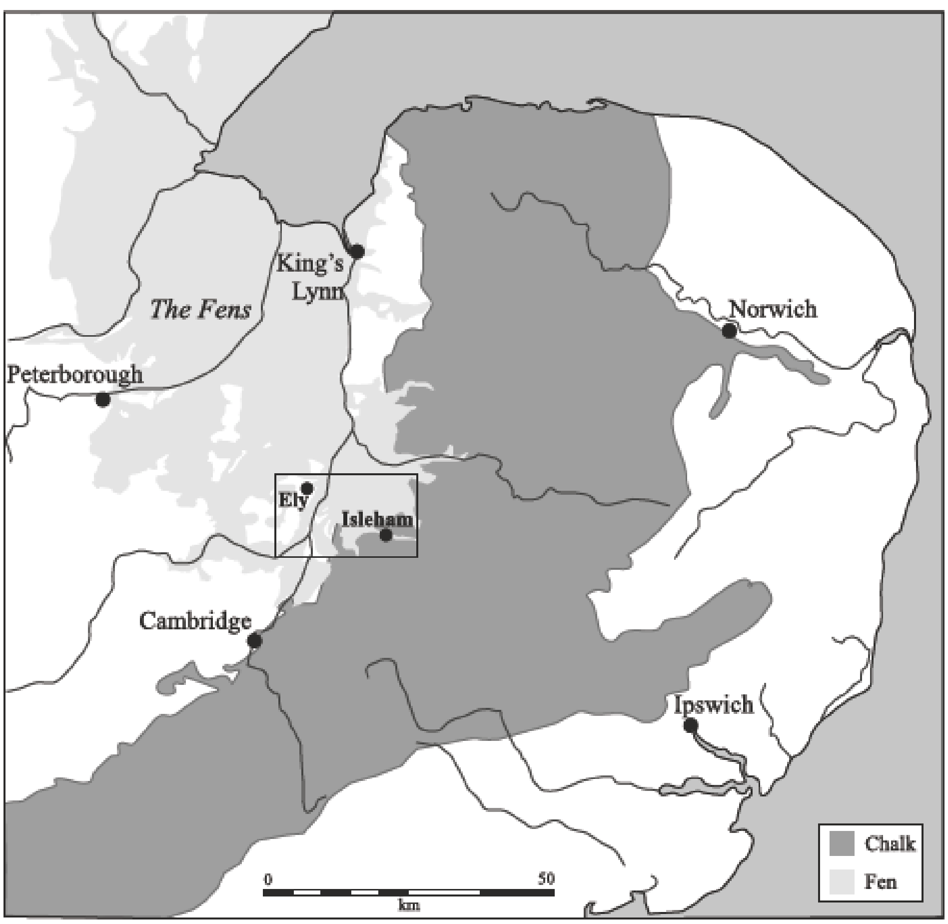


Figure 1 The Isleham-Ely area in the south-east Cambridgeshire Fens

secure additional funding from English Heritage, which allowed us to break out of the corridor and conduct broader test pit surveys.

Much of this project's methodology — particularly grid fieldwalking accompanied by in-depth metre-square test pitting — derived from the sampling procedures of the Fenland Management Project (FMP), themselves a development of the techniques employed by the Haddenham Project (see Evans 2000; Evans and Hodder 2006) which was then just drawing to a close. In many respects, the pipeline work was envisaged as a direct adjunct of the FMP, in the course of which a number of comparably ambitious survey sampling programmes were undertaken (*e.g.* Edmonds *et al.* 1999; Evans 2003). As in those programmes, our concern on the transect was the identification and 'measure' of pre-later Bronze Age occupation sites (*i.e.* usually without robust cut features), both as surface and buried scatters.

The Cambridge Archaeological Unit still regularly practises such sampling in its fieldwork, with the aim that a degree of standard measures is essential to the development of a truly *comparative archaeology*. While a truism, it is worth repeating that all our investigations are samples. We never excavate 100% of a site or investigate all of a landscape, and their 'totality' will invariably escape us. Therefore, the key issue remains determining how formally sampling procedures are applied, so that different data sets (*i.e.* surface and cut feature finds densities) can be cross-interrogated and the results from one site directly related to those from another.

In hindsight, it is salient to consider the degree to which these surface sampling techniques and other pre-excavation investigation procedures (*e.g.* chemical testing) seem to have been more widely applied in the early/mid 1990s than in more recent years. This is probably attributable to the more stringent enforcement and standardisation in the application of PPG16 developer-funded archaeology since then, which now often leads to vast area-stripping programmes. Inevitably guided by a degree of financial expediency, this kind of method more often than not results in a massive loss of top-/buried soil data. Gains in the breadth of landscape-scale exposure have resulted in a sacrifice of in-depth information. This is despite the fact that certain categories of early 'open' site activity are just not susceptible to area-strip excavation alone. Too often, the primary record of three millennia or more of domestic usage is simply machined off, and it should come as no surprise that archaeology of the period is still so dominated by monuments. Hopefully, the quality of the Isleham results may prompt some re-appraisal of these issues and, perhaps, encourage greater methodological innovation. Although certainly meagrely funded by current standards, this fieldwork programme represents an attempt to push beyond the self-imposed 'box' of what has come to be rigidly standard practice and to do something different. Within the constraints set by the development, field investigation and subsequent analysis were conducted at several scales. In the initial stage, attention focused on predicted occupation areas (principally at the fen margins), while the intervening landscape — between these and known sites — was sampled. Together with palaeoenvironmental data, samples of flint, burnt flint and other materials provided a context in which to explore specific models for the character of later prehistoric landscape occupation across a diverse range of conditions. A summary of this phase of extensive evaluation, and a synthesis of the palaeoenvironmental sequence for the area, forms the first section of this report. As a consequence of landscape sampling, six significant sites were designated for further investigation ahead of construction. These were located at the neck of the sand and chalk peninsula of Isleham, down its gradually sloping western edge towards the braided palaeochannels of the River Snail. This occupation-rich zone on the chalk contrasted greatly with areas of the fen that showed no sign whatsoever of early occupation where they were crossed by the pipeline. Two of these sites also saw a programme of enhanced and more extensive fieldwork, and these form the main body of this report. The archaeological programme was devised and conducted by Cambridge Archaeological Unit, monitored by archaeological consultants from Gifford and Partners on behalf of Anglian Water, and was overseen by Development Control officers from the Archaeology Section of Cambridgeshire County Council.

2. Landscape Sampling

I. Introduction

(Pl. I; Figs 2–4)

The Isleham–Ely pipeline project offered a chance to address several concerns. At the broadest level, a transect across a diverse range of geologies and relict ecologies provided insights into the character and condition of archaeological deposits and the extent and visibility of prehistoric and earlier historic sites. In accord with a central concern of the FMP, the line of the development was important because it passed through areas of known archaeological potential, and through zones for which there was little or no record. Moreover, because it cut across several different areas, the transect created an opportunity to explore specific models of prehistoric landscape occupation (Fig. 2). The aim of the study, therefore, was not to provide a definitive account of specific settlements or the economic base of individual sites. Rather, as Gregson has outlined (1982), it was to indicate the range of different kinds of site encountered in different landscape settings along the transect as a whole.

A long and varied history of discovery in the area gave some indication of specific potentials, and was crucial to the design of methods in the field. In the 1980s in particular, the Fenland Survey had shown marked differences in the density and date of prehistoric scatters, which had implications for the pipeline-related work. Beyond low densities on the fringes of Ely, relatively few scatters were known in the Stuntney/Ely area; while significant concentrations were identified around Soham, these lay on peninsulas and islands of higher and drier land some way outside the route (Edmonds *et al.* 1999; Hall 1996). Towards the south-eastern end of the pipeline, work in the Isleham region had recorded a wealth of artefact scatters clustering around the ragged fen

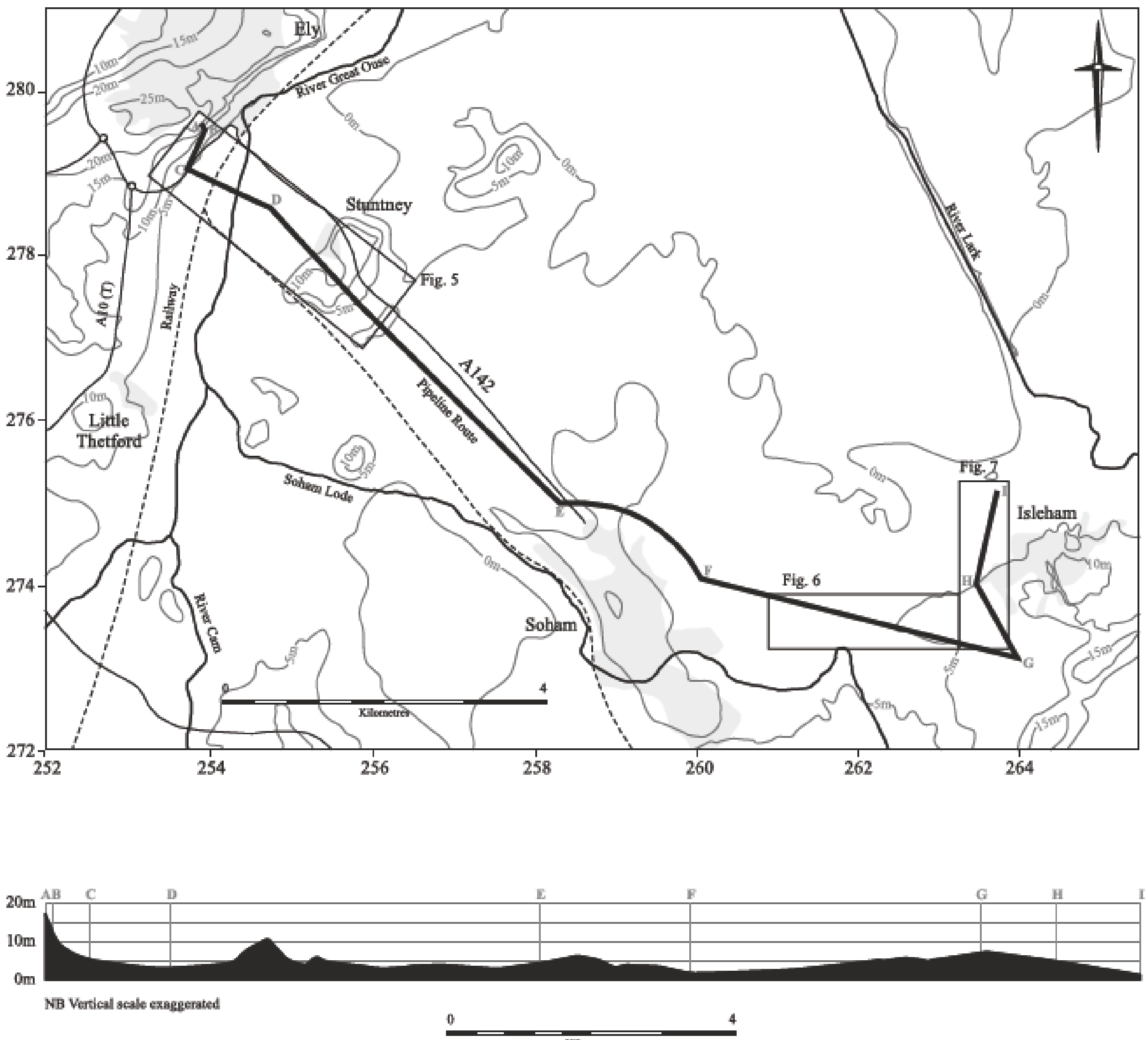


Figure 2 Route and topographic setting of the Isleham–Ely pipeline

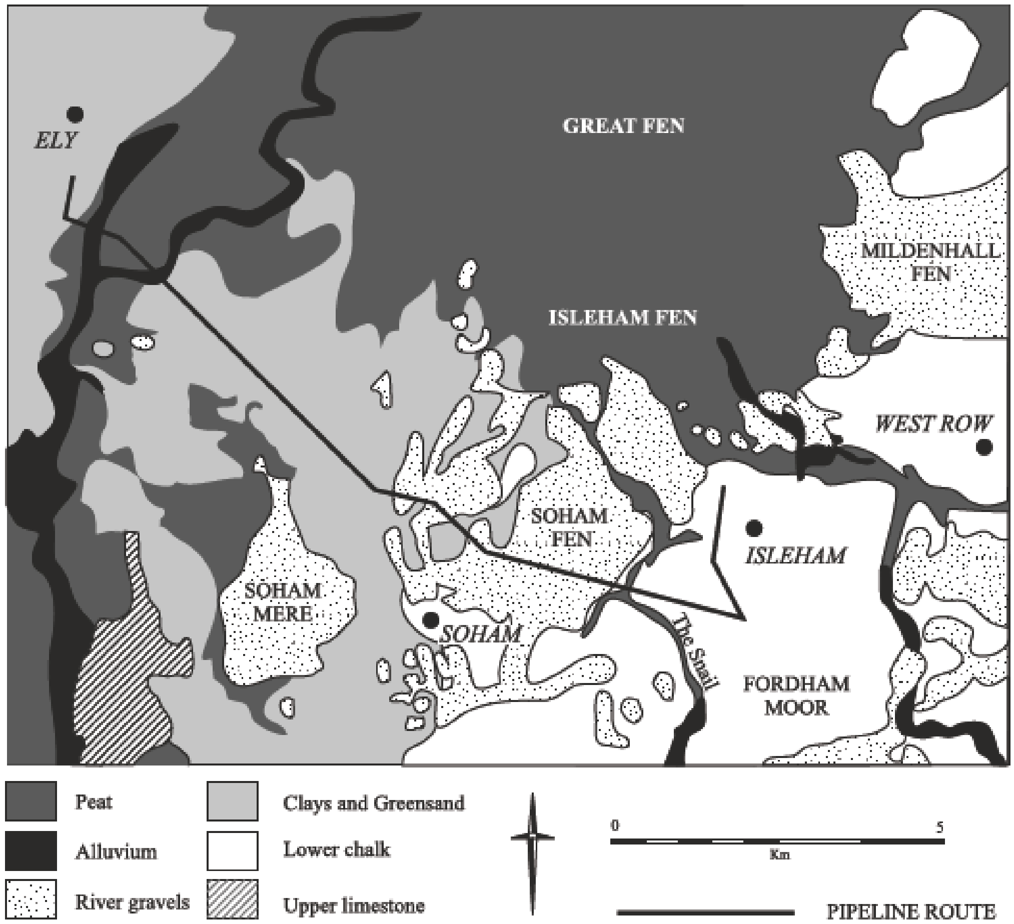


Figure 3 Geological and sedimentary boundaries crossed by the Isleham–Ely pipeline

Plate I Machine stripping at Prickwillow Road

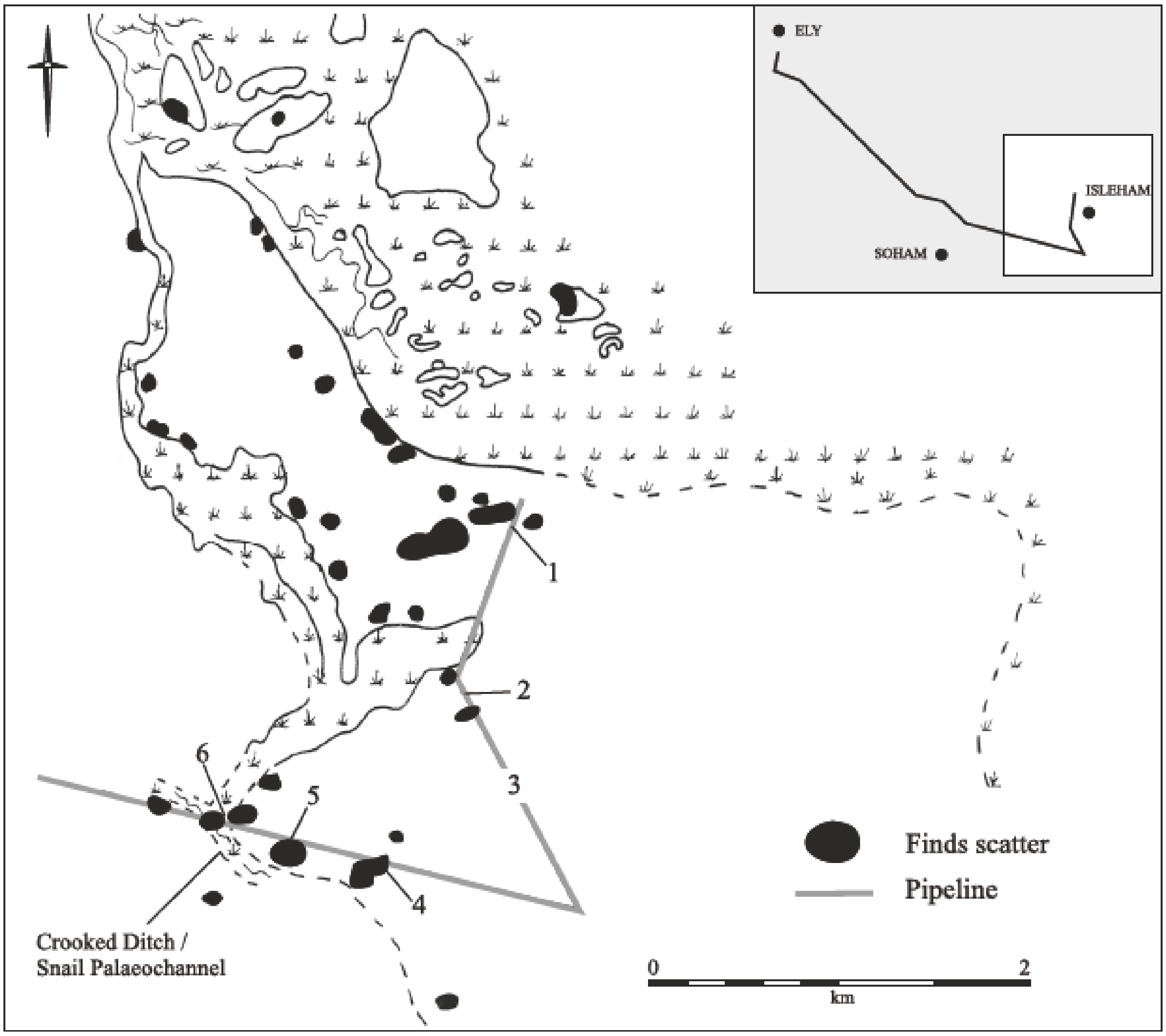


Figure 4 Distribution of lithic scatters in the Isleham region (after Hall 1996)

margins (Clark 1933; Hall 1996). The Fenland Survey (*cf.* Hall and Coles 1994) documented a proliferation of prehistoric sites fringing the south-eastern fen edge around Mildenhall and Isleham, extending into the relict course of the former River Snail between Fordham and Snailwell. Here the density of flint scatters was so great that it was sometimes difficult to identify the boundaries between them (Hall, *pers. comm.*). Ceramic evidence was still apparent in some of the scatters at that time, confirming the dates, artefact range and site character seen in the 1930s by Clark and fifty years later by Shell (Shell, *pers. comm.*). In recent years, however, it has become increasingly rare to find pottery sherds surviving amongst the surface scatters due to their continued attrition in the plough zone — a situation common to most intensive arable regions (Crowther *et al.* 1985; Richards 1990; Boismier 1991).

A significant contribution to the general distribution of sites, or at least to the list of notable finds, had also been made by metal detectorists, farm workers and informal fieldwalkers. Interest in the area by these and other collectors was stimulated by the discovery of the Isleham Hoard, an extraordinarily large assemblage of Late Bronze Age metalwork found in a chalk-cut pit in the late 1950s, approximately 1km south-west of the Snail channel (Britton 1960). Since the hoard's precise location has never been established, numerous attempts have been made to locate it and potentially associated features, leading to much post-harvest activity and a concomitant rise in the recognition and collection of diagnostic lithic implements. Axes or other large stone artefacts trapped in sorting machines during the harvest of root crops have also found their way into local collections; while frequencies are difficult to quantify, they are sufficiently numerous to suggest a real density of activity across the area.

Hall's survey results for the south-eastern fen (1994, 56; 1996) show the chalk dryland narrowing north-westwards into a peninsula, with a dense cluster of predominantly Neolithic scatters mainly bordering its west side, adjacent to the former route of the River Snail (Fig. 3). Mesolithic to Bronze Age lithics and burnt flints were identified in varying quantities among the peninsula's assemblages. The eastern and central part yielded fewer scatters but two found near the mouth of the peninsula were quite large. These two (Hall's Isleham Sites 6 and 7: Hall 1996, 85, fig. 41) consist mainly of lithics although Neolithic pottery was also recorded at the time. Few prehistoric sites had been excavated in the Isleham region although one unpublished site of relevance occurs

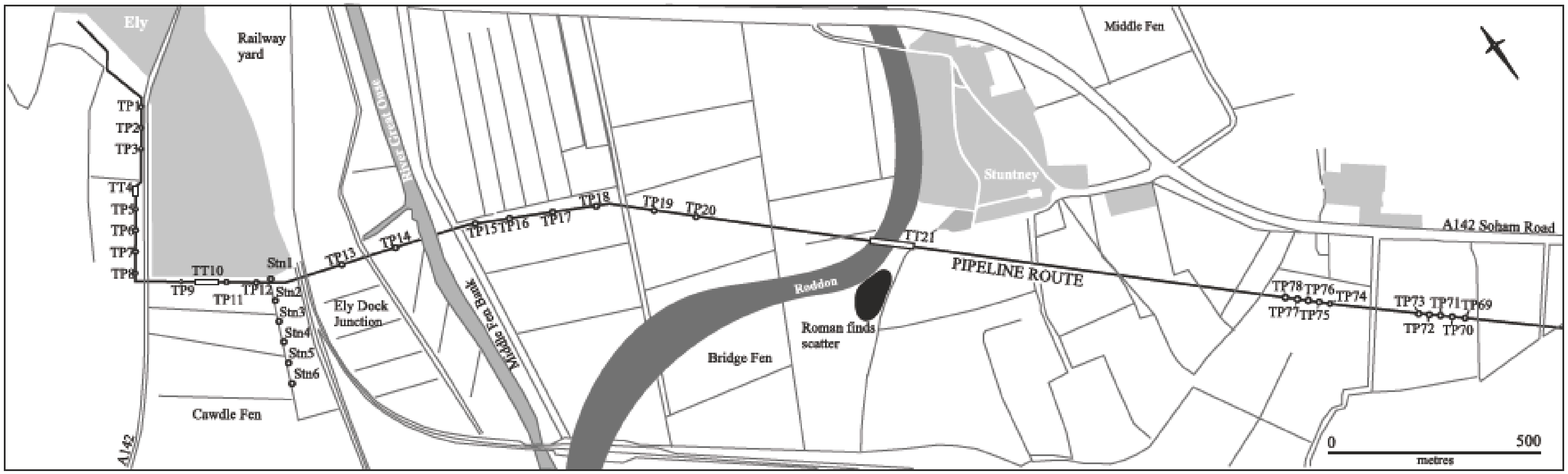


Figure 5 Test pits and trial trenches in relation to known archaeology on the pipeline route: Western Sector

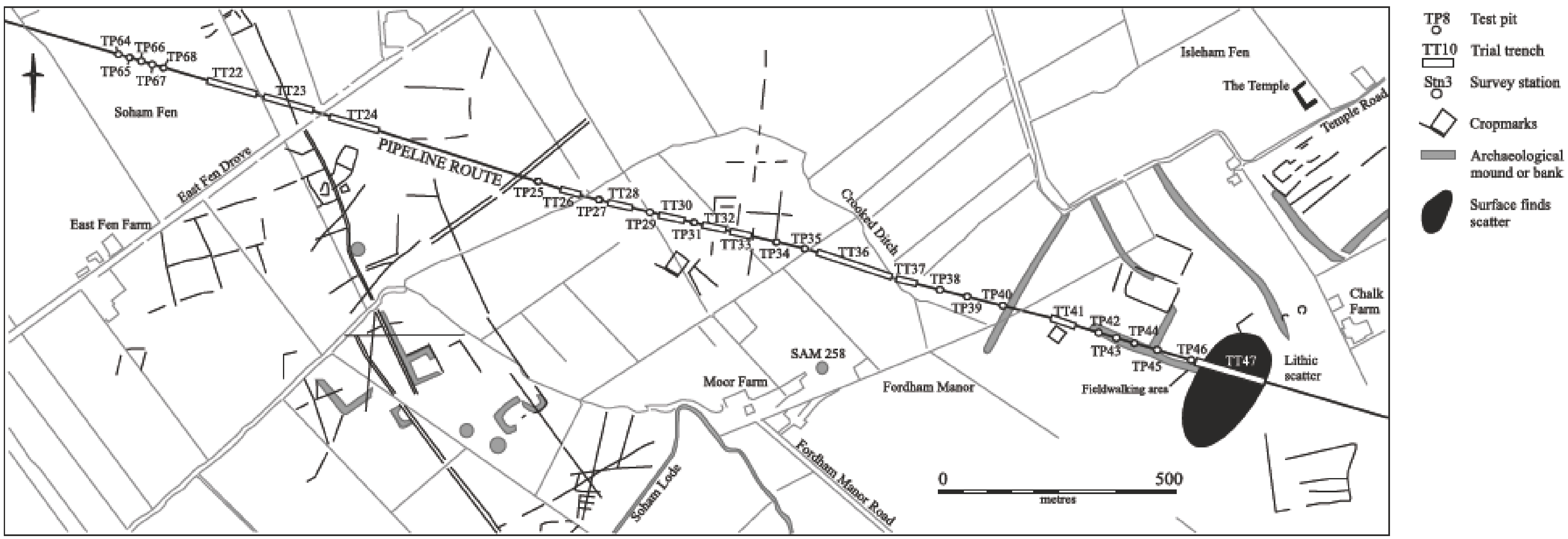


Figure 6 Test pits and trial trenches in relation to known archaeology on the pipeline route: Central Sector

800m west-north-west of the pipeline's Prickwillow Road site at the fen edge (see also Hall's Site 8: Hall 1996, fig. 41). This Neolithic and Early Bronze Age pottery and flint scatter was investigated twice: by Clark in 1932 and Shell in 1982. Beaker and Collared Urn pottery sherds were recovered in association with large quantities of flint and nineteen features in a pair of 3m x 2m hand-excavated sondages. Among the excavated deposits was an 'ashy' layer containing charcoal and humic layers from which human bone and a near complete Collared Urn were recovered (Shell, *pers. comm.*).

Evaluation of the pipeline route involved the standard suite of prospection techniques: rectified air photographic plots, geophysical survey, targeted fieldwalking, evaluation trenches and 2m x 2m test pits to check the results and to explore the blank areas in between known sites. The length of the trenches was governed by existing cropmarks and surface scatter information where these occurred, with the test pits at 50m intervals in between. Blank areas were investigated using random samples, designed as 100m blocks containing five test pits on a 25m interval and using the south-west corner of each as an artefact survey point. Two distinct areas were targeted for assessment: the Ely–Stuntney peats and the Ouse roddon, and Soham Fen and the Snail channel to Isleham.

II. Methodology

(Figs 5–7)

In association with fieldwalking and trenching, samples of individual soil horizons (ploughsoils, buried soils *etc.*) were hand-sorted or sieved at 25m intervals along the evaluation trenches. A simple survey of 30 litres (two buckets) defined general levels of artefacts present in each horizon and thus identified, in broad terms, the presence or absence of 'sites' and proximity to their cores. This method has an advantage over fieldwalking since field conditions are frequently unsuitable for fieldwalking in development-led projects, where an emphasis on the construction timetable takes precedence over adherence to the farming calendar. In such cases, artefacts held within the soil horizons were available for simple statistical purposes and allowed the rapid identification of 'background'. The two-bucket check method was adapted from a detailed programme of soil sorting/sieving from 1m x 1m spit-excavated test pits dug through sites during the Fenland Management Project (*cf.* Boast and Evans 1991). A combination of trenches and machine dug test pits was cut between Isleham and Soham, while test pits were the main method of exploration between Soham and Ely. In areas of deeper strata (*e.g.* Stuntney to Cawdle Fen), the test pits were doubled in width for safety reasons.

In all, 20 trial trenches (TT) and 58 test pits (TP) were machine-excavated along the 16km-long pipeline route (Figs 5–7). The total area of trial trenches was 3403.4m^2, or 1.4% of the route. Three test pits (TP1–3) at Ely were abandoned, as they fell between a playing field and the road verge and were therefore inaccessible. Two further test pits (TP13–14) in the washlands bordering the River Ouse were also abandoned, since they fell within an environmentally sensitive area (county wildlife and nature protection area). In substitution of the latter, a newly-cleaned adjacent dyke was recorded and investigated

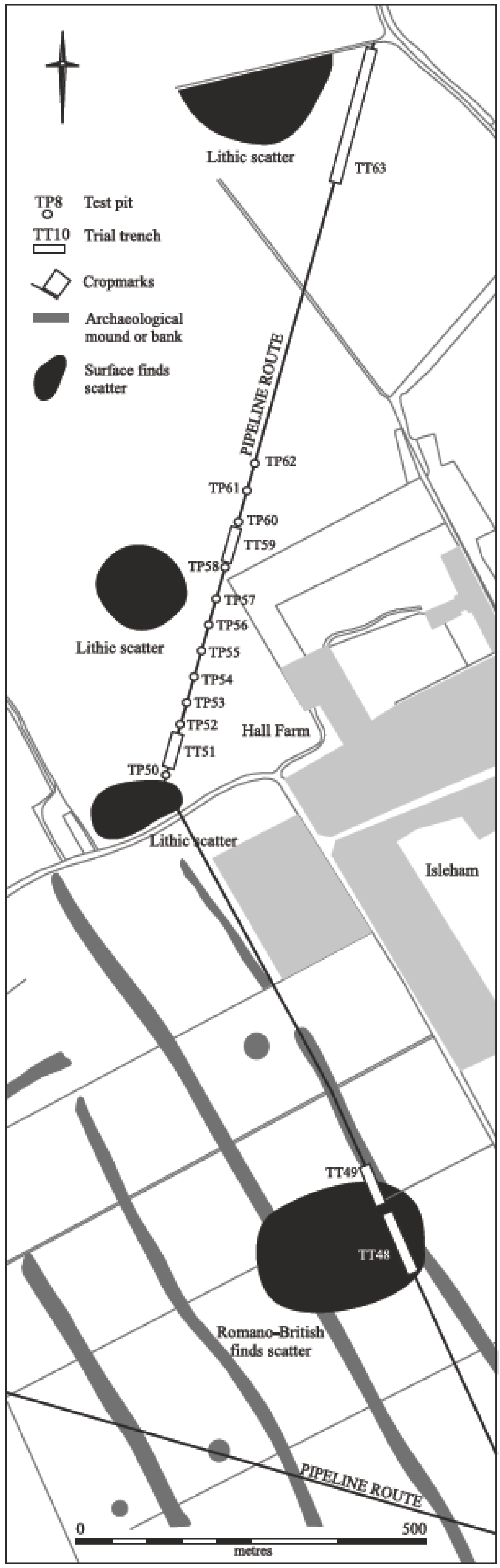


Figure 7 Test pits and trial trenches in relation to known archaeology on the pipeline route: Eastern Sector

for archaeological evidence. None was found. The peat cover, alluvium and Jurassic clay depths were recorded and photographed.

A summary of the prehistoric archaeology encountered along the transect, commencing at the south-eastern end, is presented in Table 1. Soil sequences and information for the 'blank' areas are held within the archive and are not reproduced here.

III. Archaeological features from evaluation of the Isleham–Ely pipeline

(Pl. II; Figs 8–13)

TT63

(Fig. 8)

The ploughsoil cover in this trench varied between 0.25 and 0.40m in depth with plough scars evident within the top of the natural chalk. Two broad areas of surviving 'buried soils' (one 50m and the other 25m wide) initially confused the archaeological *vs.* natural sequence but a machined sondage proved these to be depressions in the chalk which had trapped and preserved early soil formations. A sondage was machine-excavated through the 25m depression and was seen to contain three soil horizons over its 0.80m depth. Archaeological features consisted of:

F.5 An irregular ovoid pit *006*, 1.70 x 1.0m, was *c.* 0.45m deep and contained the articulated skeleton of a cow (*005*). The pit was backfilled with a pale grey chalky silt clay (*007*) containing moderate fine–medium chalk fragments and natural flints. The cow was oriented SE–NW (head–toe) in the pit with its skull upturned (and badly plough-damaged as a result) and its legs tightly folded beneath its body. No associated finds were recovered.

F.8 A shallow, irregular but principally flat-bottomed ditch (*008*) was 0.30m deep and 2.0m wide. It was filled with a mid-brownish grey sandy silt loam with moderate fine–medium chalk fragments towards the base (*010*) becoming more friable and organic (peaty?) towards the top (*009*). Large quantities of animal bone (including cat bones) and flints were recovered from the fill, particularly from its southern irregular edge where markedly more bone (predominantly cattle but also pig) and rounded stones (some burnt) were evident.

F.9 A steep-sided pit with a sub-rounded base was dug against the east facing section of TT63 and was 0.25m deep and *c.* 0.45m wide (*013*). It was filled with a brownish grey sandy silt (*012*) mottled with tan iron stains, containing occasional fine–medium chalk fragments and charcoal flecks. Fragments of animal bone (sub-adult bull), including part of a cow skull, and flint were recovered.

F.10 A sub-circular pit, roughly 0.70m in diameter, was steep-sided with a flat base (*015*). It was filled with a greyish brown clay silt containing sandy patches, occasional charcoal flecks and fine sub-angular natural flints (*011*). The northern edge of F.10 had become undercut in the sandy natural sub-stratum and the southern edge was nearly vertical. A large quantity of animal bones, principally juvenile pig and lamb, were recovered from the base of the pit as well as struck flint flakes and burnt stones. Fragments of sheep/goat recovered showed evidence of butchery, including decapitation marks on the neck vertebra.

Immediately north of F.10 were two circular shallow scoops, approximately 0.45–0.50m in diameter. As they were only 50–100mm deep it is difficult to be sure of their archaeological origin. One had a chalky silt internal fill (and a mid-brownish grey clay silt fill around the edges) possibly denoting an uprooted post. The depth (55mm) disallowed any certain interpretation to be made.

F.11 A sub-circular pit (*016*) roughly 1m in diameter had steep edges and a sloping base. It was filled with a mid-brownish grey sandy silt with moderate angular chalk fragments and charcoal flecks (*017*). The top part of the fill was quite friable/loamy, perhaps topsoil derived, and the pit contained animal bone throughout its profile. Patches of disturbed subsoil, thought to be caused by burrowing animals, was observed just north of F.11.

F.12 An irregular 'feature' (*018*), *c.* 2.50m wide (N–S) and 0.45–50m deep, with well-defined north and west edges but indistinct southern edge, occurred against the eastern trench edge. Its base was pock-marked with root channels infilled with a mid-greyish brown silty loam. Generally the feature was filled with a compact pale grey clay silt containing frequent fine chalk fragments and occasional charcoal flecks (*019/020*).

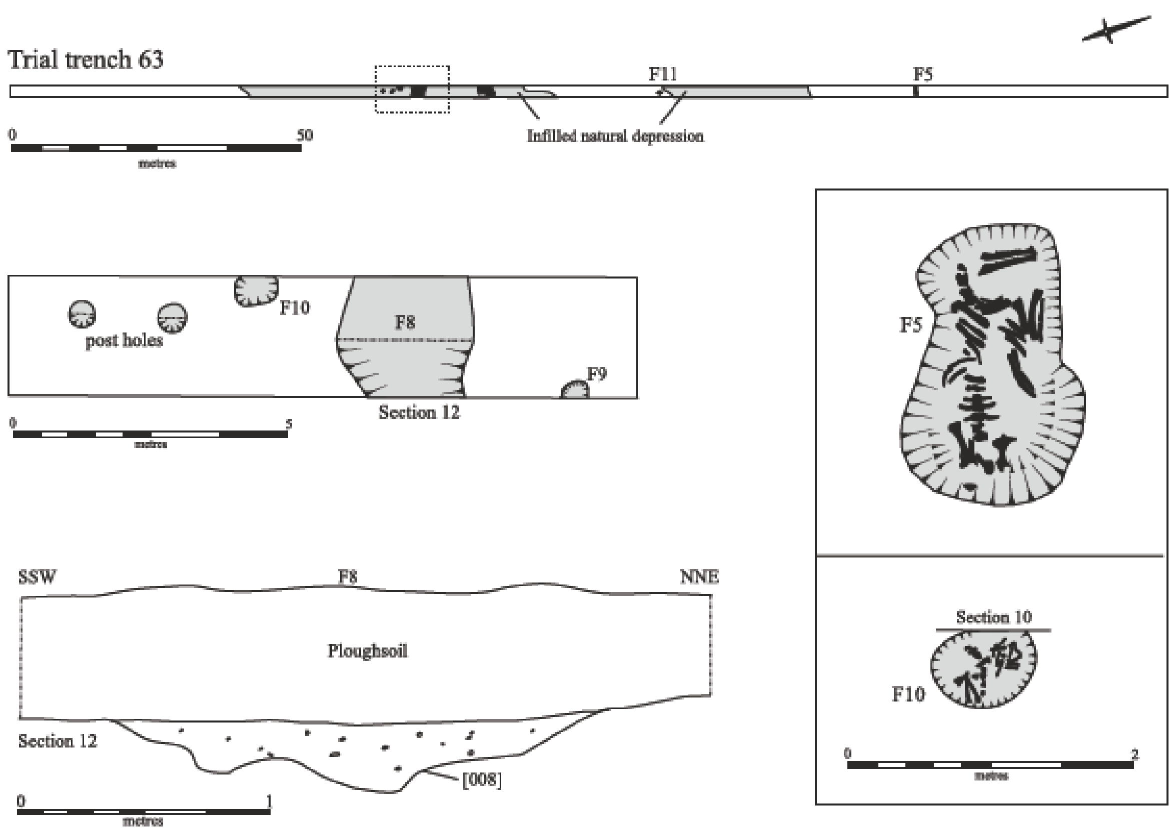


Figure 8 TT63, plan and sections of selected features

TT/TP	*Length*	*Location*	*Description*	*Adjacent cropmarks/Sites*
TT63	200m	Isleham Fen	E–W ditch, F.8; two possible post-holes, F.9 & F.10; pit with cow burial, F.5. Flint and burnt flint present.	Two scatter sites 100m east of TT63: one small Mesolithic/Neolithic flint scatter, One Beaker pottery and flint scatter. Neolithic flint scatter 400m west.
TT51	50m	Hall Farm, Isleham.	Dry relict pond preserving flint-rich palaeosols in natural in-fill sequence. One possible linear feature with large volume of burnt flint, F.24. Worked flint present.	Pond banks visible as 'earthworks'. Neolithic flint scatter 200m west, Mesolithic/Neolithic flint scatter 100m south-west. Isolated Romano-British finds to east towards Hall farm.
TT49	50m	Isleham	Two ditches: one NW–SE (F.3) cutting into a ditch (F.4), probably Romano-British. Flint and burnt flint present.	Romano-British finds scatter (locus is *c.* 100m west). No cropmarks.
TT47	150m	Chalk Farm, Isleham.	Five post-holes, F.14–15, 17–19. Iron Age bell-shaped storage pit, F.13. Flint and burnt flint present.	Bronze Age flint scatter (dissected by route). Cropmarks of field system 100m north; two ring ditches *c.* 200m north-east.
TP45	2m x 2m		Roughly E–W ditch (F.16), possibly Iron Age, certainly prehistoric.	Cropmarks of a field system *c.* 8m north, extending for 140m north and 150m west. 100m north-west of F.16.
TT41	50m	Snail valley Isleham	Two possible features. Unexcavated, very sandy fills. Flint and burnt flint present.	Rectangular undated cropmark just south of route. Prehistoric finds scatters from 50m south and west to Snail channel.
TP40	2m x 2m		Base of possible feature or tree root, F.20/21. Flint and burnt flint present.	Scatter of Romano-British pottery and tiles *c.* 50m to south.
TT37	37m	Snail valley, Fordham	Relict stream channel. Dense flint/burnt flint scatters and possible middens. Pockets of remnant palaeosol trapped within slight depressions in the natural soil. Of major significance: human bone found; skull fragments and femur.	Banks and terraces of the relict stream channel across Fordham moor, seen as soilmarks in ploughed fields and as earthworks under pasture. SAM barrow (258) *c.* 200m south. Flint scatter sites, mapped by Fenland Project, on river terrace and valley situations.
TT36	160m		One pit with burnt flint, F.22. Numerous depressions with remnant peaty, flint-rich palaeosols. Plough scarred natural soil.	As above.
TT33	40m		No features, Low density flint and burnt flint	As above.
TT30	50m		Circular shallow scoops could be bases of plough-damaged pits or root action/ natural hollows.	Undated sub-rectangular and linear cropmarks *c.* 100m south.
TP29	2x2m	Fordham Moor	2.0–2.5m wide NW–SE ditch, F.29.	Cropmark visible in sugar beet, major former field boundary. Air photos show it to be on same alignment as extensive field system cropmarks 500–600m further south-west.
TT26	40m	Fordham Moor	Five parallel NE–SW ditches, 10m apart, one with perpendicular junction with a sixth. Very shallow (< 50mm), probable modern agriculture/drainage marks.	Double ditched (droveway?) system, 80m to north-west.
TT24	100m	East Fen Drove, Soham	2m wide NW–SE field boundary ditch F.26. Two prehistoric pits containing bone and pottery, F.25 and F.27. Flint and burnt flint present.	Linear cropmark of field boundary also visible in field. Rectangular enclosure (fields?) cropmarks 40m to south. Extensive field system and barrow/ ring ditch cropmarks for *c.* 600m further south-west from this.
TT23	100m		3m wide unexcavated NW–SE ditch, F.30 (parallel to F.29 and F.26). Flint and burnt flint present.	Cropmark of NW–SE linear ditch (with parallel ditch — droveway — showing further south-east).
TT21	100m	Stuntney	Trench through silted up river channel — part of the braided former course of the River Ouse. Recent agricultural marling pits seen heading northwest across fen from west side of relict channel.	RB finds scatter and dock structures 100–150m south-west.

Table 1 Summary of archaeology encountered during pipeline evaluation

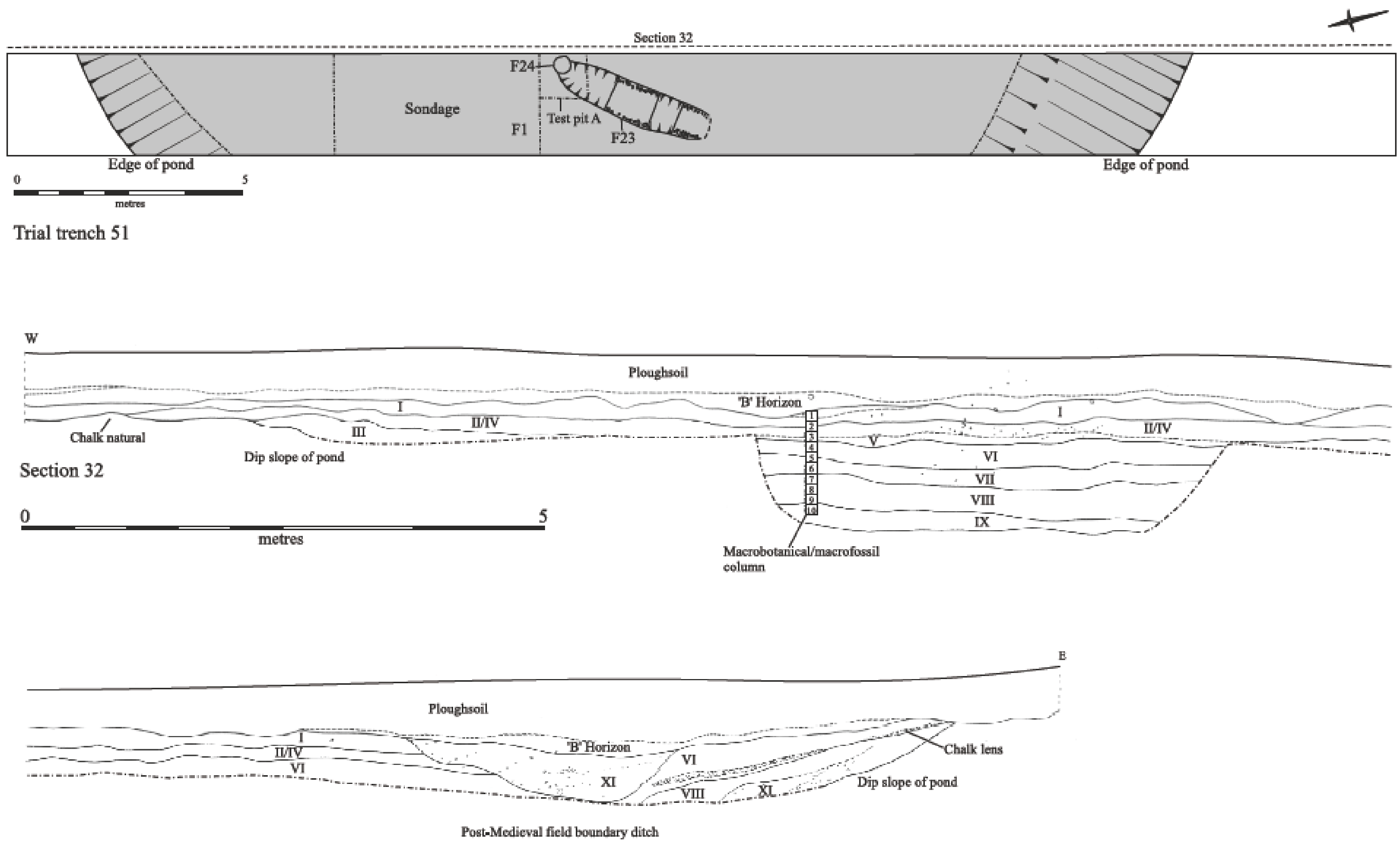


Figure 9 TT51, base plan of features and section through pond (F.1)

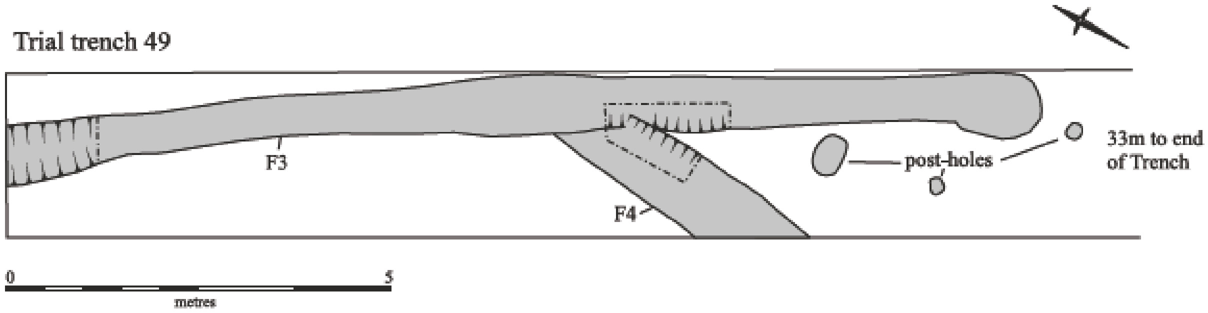


Figure 10 TT49, plan of excavated features

Struck flint and eroded animal bones were recovered from these fills. A thin patch of remnant palaeosol occurred at the top of the feature beneath the plough zone (*021*) from which flints and bone were also recovered. It is difficult to determine a plausible function for this hollow given its irregular form and fill types. It occurred in an area of mottled natural subsoil which obscured the visibility of the edges, and may well be nothing more than a tree throw hollow in which material has accumulated over time. Nevertheless, the quantity of material recovered from its fills constitutes an important body of evidence for activity in the immediate vicinity.

TT51
(Fig. 9)
As far as could be detected from ground level, this trench cut through a sub-circular field depression. This was visible as an uneven encircling ridge, one of many evident in this part of Isleham Fen (see TT63). The ploughsoil cover was quite deep here (0.40–0.50m), of greater depth over the depression and decreasing southwards.

F.1 The desiccated fills (I–IX, Fig. 6) within a naturally infilled pond (F.1) were evident in a machine sondage. It was 25m wide in the trench base although the field depression was much larger (*c.* 50m). A NW–SE post-medieval field boundary ditch was seen to cut into the upper profile of the pond towards its southern extent. This field boundary is marked on the 1903 edition of the Ordnance Survey, and to its east stood a windmill. The mound of the latter is still (barely) visible in the field to the south of *TT51*.

The sondage revealed the slowly accreted organic layers of the pond, most of which contained good mollusc assemblages and the probability of surviving seed remains. To complement the environmental evidence, a 1m x 1m test pit was hand excavated against the edge of the sondage section face to determine the density of artefacts incorporated in the pond. Layers VI– IX were available for analysis within the test pit. VI and VII yielded burnt flint (VI = 10; VII = 8), struck flint (VI = 17; VII = 8) and bone (VI = 4; VII = 12) but the basal organic mud (VIII) was devoid of finds. Most visible was layer II/IV (IV was the paler edge and base weathering equivalent of II) which yielded copious quantities of flint, evident in the section. Since it occurred at the top of the pond profile, and contained so many finds, it was thought to be the surviving buried soil which had been developed over/around and trapped by F.1.

F.24 An irregular linear feature, oriented NE–SW, was evident in the trench base cutting through the pond infill. It was most distinct due to the surprisingly high quantities of burnt flint in its fill (*003*). It varied between 0.80m and 0.50m in width and excavation showed it to be up to 0.80mm deep. In plan it resembled a ditch lined with burnt flint but no form was apparent in the two 1m-wide sections dug through it. The burnt flint did not form a regular lining although it did appear to concentrate around the edges of the 'feature'. The trench edge was thoroughly cleaned here and showed pond layer II/IV to be at the equivalent height of F.24. It is possible that this flint-rich layer filled a small gully formed either by human hand or by natural agencies. If the former proves to be the case then it is possible that the feature may have had an industrial function, perhaps a cooling line in the preparation of flint for tool manufacture. Two hundred and forty eight fragments of burnt flint and nine worked flints were recovered along with three fragments of bone.

F.23 At the north-east end of F.24 was a small post-hole-like feature, *c.* 0.40m in diameter and 0.15m deep (*002*). It was filled with a mid-greyish brown silty loam (*001*) with moderate fine chalk fragments and occasional shell fragments and charcoal flecks. Flint, burnt flint and animal bones were recovered.

TT49 and TT48
(Fig. 10)
These trenches traversed a known Romano-British finds scatter. The grid reference of the scatter is *c.* 100m west of the pipeline at this point, but it was thought to be extensive and likely to be affected by construction.

F.2 A narrow NNE–SSW ditch (unexcavated) contained a pale-mid brownish grey sandy silt fill, from the surface of which two abraded Romano-British pottery sherds were recovered (TT48).

F.3 A NW–SE oriented ditch was 0.70m wide and 0.25m deep (*067*). It was filled with a pale greyish brown slightly sandy silt (*066*) which yielded pottery (Romano-British) and bone (TT49).

F.4 A N–S ditch was cut into by F.3 and was 0.80m wide and 0.20m deep (*069*). Its fill (*068*) was similar to *066* although slightly browner. One pottery fragment came from F.4 (TT49).

Three small features, possibly post-holes, lay just south of F.4 but were not excavated. Despite the discovery of these two ditches little can be said about the nature of the scatter. It is most likely that the settlement locus lies 100m to the west (where the majority of the scatter is situated) and that these ditches represent elements of the associated field system.

TT47
(Fig. 11)
Prior to trenching in this area grid fieldwalking was undertaken of a Bronze Age flint scatter (07932) across a 10m wide corridor over a distance of 150m. Collection commenced at the eastern end of the trench (Box A) and worked west to Box O. The field conditions were not conducive to high levels of finds retrieval. The subsequently-machined trench revealed settlement remains.

F.14–15 Two post-holes, 0.35m wide and between 0.10 and 0.15m deep, were filled with pale greyish brown sandy silt (*024*, *026*). One burnt flint was recovered from F.15.

F.17–19 Three post-holes, forming a line oriented roughly E–W, were *c.* 0.25m wide and of various depths. Only 50mm survived of F.18 whereas F.19 was 0.12m deep and F.17 was 0.20m deep. They contained similar fills: pale brownish grey clayish silts (*030*, *038* and *040*) and a burnt flint was found in F.19.

F.13 A sub-circular beehive-shaped storage pit, *022* (pit form E, Bersu 1940, 49), had a 1.15m-wide aperture and was 0.75–0.90m deep. Its base sloped downwards towards the north where it met a vertical face cut into the chalk. Here, the edge was deeply undercut (by 0.50m) and had a convex upper edge above the lower vertical face. The edge became less sharply undercut southwards, although the east edge also had a (smaller) lower vertical face. Small depressions were evident in the chalk base, presumably from the hewn rock, in which cultural material had gathered. The pit had three distinct fills: the lower comprised a dark brownish grey clay silt with frequent charcoal flecks and occasional fine chalk fragments (*047*). One hundred and four earlier Iron Age pottery sherds and bone fragments and some struck flints were recovered from

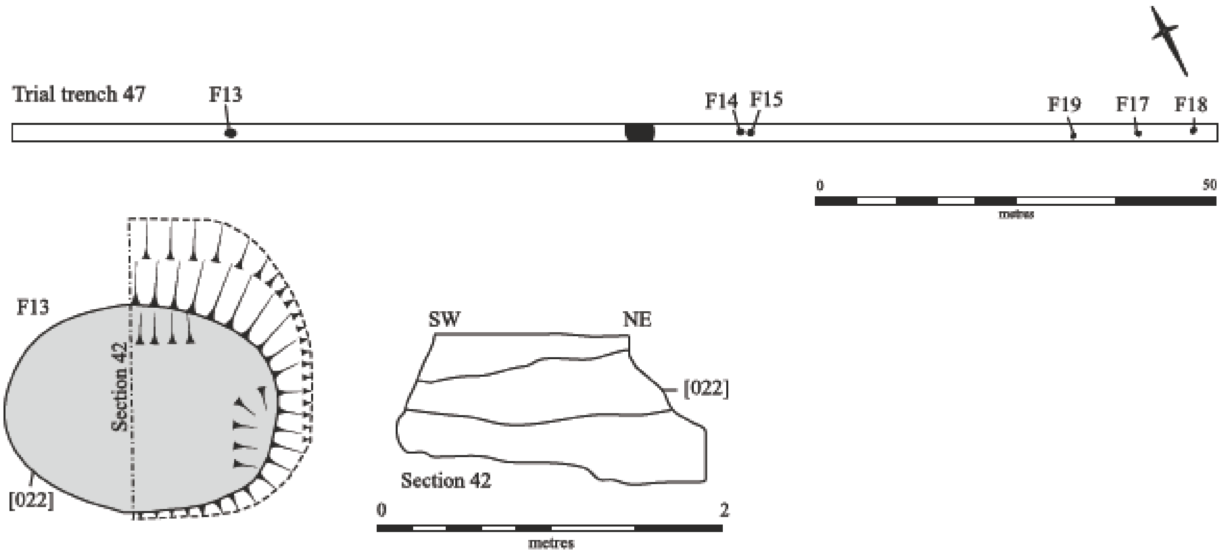


Figure 11 TT 47, plan and section of excavated features

this fill. Above this was a mid-brownish grey clayish silt with frequent fine chalk fragments and occasional charcoal flecks (*046*). One hundred and forty-seven predominantly smaller pottery sherds, flints and bone fragments were recovered. The tertiary fill (*023*) was a friable mid-brownish grey chalky clay silt, from which bone and seventeen crushed/abraded fragments of pottery were collected.

A sondage was dug through a 3.5m-wide depression, initially thought to be a N–S ditch. It contained what appeared to be a relict palaeosol of a mid-yellowish brown clayish silt. The trench was generally covered with 0.25–0.30m of ploughsoil. Despite the vertical truncation caused by years of ploughing, settlement evidence survived in the form of post-holes and a storage pit. While no conclusive dating evidence came from the post-holes it may be assumed that they either relate to the Bronze Age flint scatter evidence or that they are remains of structures associated with the Iron Age pit.

TP45

A short length of a hitherto unknown possible field boundary ditch was revealed in this test pit. It is not visible on the air photographic coverage of this area but must form part of the field systems associated with the Romano-British settlement off to the north.

F.16 An ESE–WNW ditch (*029*) was 1.60m wide and 0.53m deep. It had gently concave edges and a sub-rounded base. It was filled with a mid-yellowish brown compact, slightly clayish silt (*028*) which contained occasional fine chalk fragments, charcoal flecks and very fine flecks of bright red fired clay. Two sherds of Romano-British pottery were recovered.

TT41

Two possible features were recorded but not excavated in this trench. One was an oval pit (1.30m x 1m) containing a compact pale brownish grey silty sand and the other was a 0.40m-diameter pit with a similar fill. Given the dimensions of the Iron Age pit, F.13, the oval pit here may also be a storage pit and, therefore, part of the Iron Age settlement.

TP40

The integrity of this feature as an archaeological pit was questionable due to its shallow survival and irregularity. However, since a known Romano-British finds scatter, including building material, exists to the south the possibility of it being a plough-damaged feature should not be ruled out.

F.21 An irregular, shallow possible pit was 60mm deep and *c.* 0.80m wide. It was disturbed by root action to the north but was filled with a friable mid-grey brown silt loam (*043/5*). Flint, bone and abraded scraps of Romano-British pottery were recovered from the fill.

TT37

(Pl. II; Fig. 12)

This trench traversed part of the peat-filled former course of the River Snail (a small channel currently survives as a short watercourse called Crooked Ditch).

F.6 The west end of TT37 was doubled in width to allow safe deep excavation within the relict waterlogged river channel. During the machining of F.6 a complete human femur was recovered from the upper organic layers (probably *035*) which necessitated a sondage to be hand dug through the edge silts in an attempt to define the context of the bone. Another aim was to determine the presence or absence of any waterlogged structural remains relating, perhaps, to waterfront or water management schemes. The machining of the channel was undertaken with great caution since it is often extremely difficult to identify naturally derived wood (*i.e.* fallen or growing *in situ*) from abandoned and/or dilapidated structural remains clearly in such small excavations. Such remains were not evident, although a great density of well-preserved natural waterlogged wood was encountered throughout the peaty layers. The channel was 1.60m deep (from below the ploughsoil) with gently sloping,

Plate II Skull fragment in section, TT37

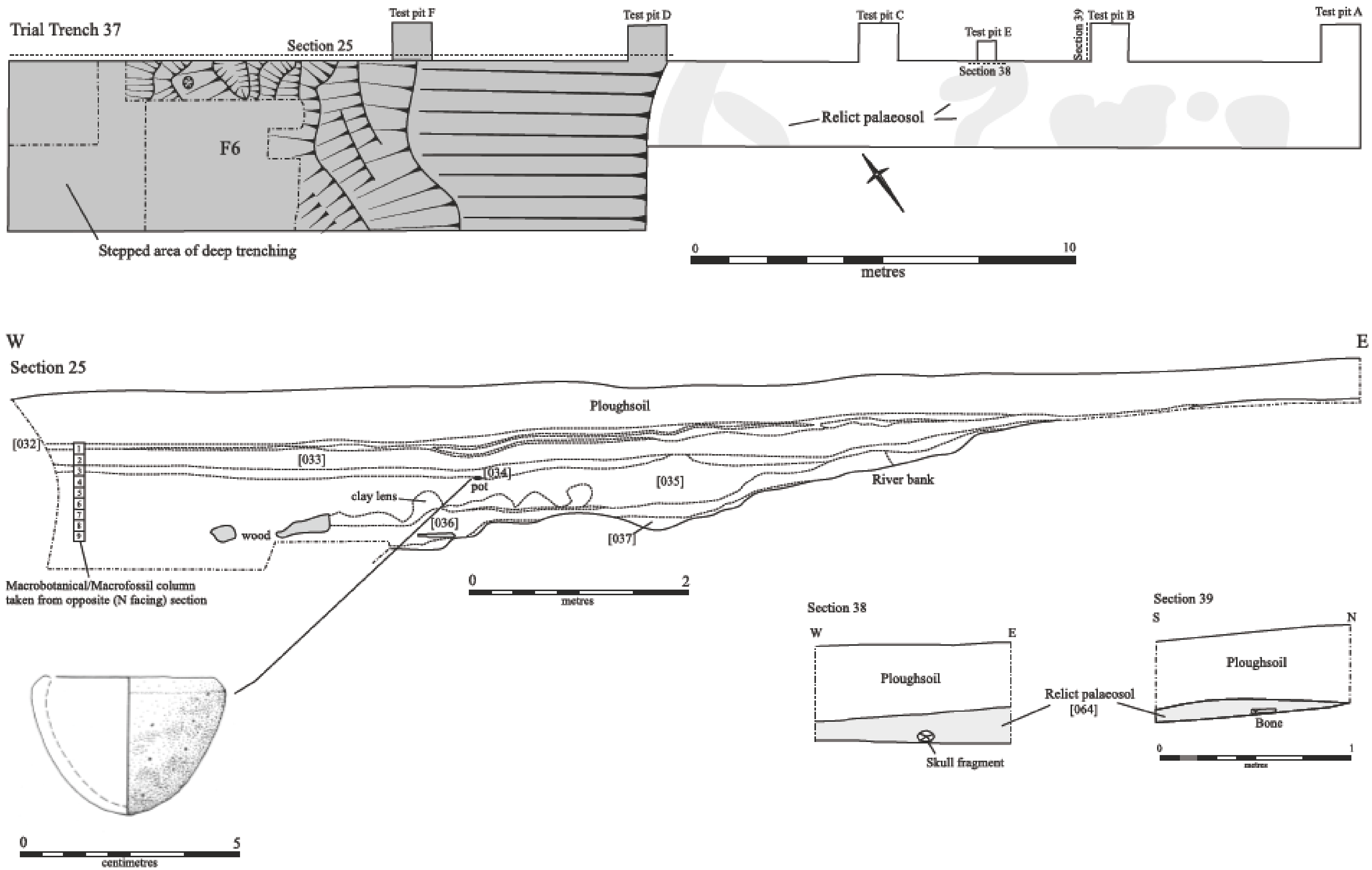


Figure 12 TT37, base plan showing plan and section of relict palaeochannel and location of miniature vessel, together with TT36: plan and section of features

root-marked edges. Three types of auger were used to extract a full column for pollen, macro-botanical and fossil sampling. Unfortunately, the varied nature of the channel deposits prohibited successful attempts, the lower 0.7m remaining intact in the event of future opportunities arising for study.

The greater part of F.6 contained dark greyish brown slowly accumulating organic muds and silts (*034*, *035*) which contained waterlogged wood and lenses of fine pale yellow/white and grey sandy silts. A sherd of Bronze Age pottery and fragments of bone were recovered from these layers. The 'higher velocity' edge silts and clays (*036*, *037*) also contained organic lenses but, most importantly, quantities of Early Neolithic flint blades and flakes and one complete tiny thumb pot (Fig. 29.5). Bone fragments and two sherds of undiagnostic Neolithic/Bronze Age pottery were also recovered from the edge silts of F.6. A pollen core and samples for macro-botanical and mollusc evidence were taken through the sediments.

The ploughsoil cover of TT37 increased from east (0.25m) to west (0.50m) over the channel. The stripping produced copious quantities of worked and burnt flint, especially at the eastern end of the trench. Test pits were hand-dug off the north side of the trench to assess the density of the flint from the banks of the river to the edges of the channel. The remains of a possible burnt flint mound, discovered through this method of investigation, were located *c.* 10m away from the river, on the east bank.

A large fragment of human skull was recovered from a peaty soil layer (*064*), thought to constitute either river outwash or a relict buried soil, which survived in patches on the river bank (Fig. 12). Its relative depth equated with that of the femur found in the channel, and while the two bones are contained in different contexts, it may be conjectured that they are related elements. A block from *064* was sampled for soil micromorphological analysis. Among the bones recovered during machining was a fragment of *Bos primigenius* (auroch), the predecessor to domesticated cattle (<*122*>, *063*). It was found, unstratified, in the spoil heap of the channel fills.

TT36

This trench was located within the pasture field on the west bank of the river and revealed a truncated soil sequence consisting of a shallow depth of peaty topsoil (0.20–0.25m) lying above the plough-scarred natural chalk.

F.22 A sub-oval pit (0.95m x 0.75m) had irregular steep edges and a sub-rounded base (*048*). It was 0.30m deep. Root action had destroyed part of its eastern edge where it was dug through a patch of sand. The pit was filled with a dense, dark grey malleable sandy clay (*050*: see Appendix 5). A mid-grey silty sand (*051*) infilled the top 50mm of the pit. The most striking part of this feature was the sheer quantity of burnt flint recovered from the excavated half of the pit. The four litres of fill recovered from the half-section were sampled for wet sieving. One litre yielded 1.2kg of burnt flint ranging from 150mm fragments to fine flakes. It may be assumed from this sample that another *c.* 3.6kg represents the greater part of the rest of the retained fill and that the entire pit could yield about 9.6kg of burnt flint. Such a quantity is astonishing. It probably indicates an 'industrial' function for F.22, although the subsequent root damage obscures this interpretation somewhat.

TT30

An oval feature (unexcavated) was apparent against the south section of this trench. It was 0.90m wide and 0.80m long, filled with a mid-greyish brown silty sand. It may represent a pit, or the butt end of a small ditch.

TP29

The 2.5m-wide boundary ditch, apparent as a cropmark within the ripe sugar beet, was revealed in plan but left unexcavated. The major field boundaries evident in the field are indicated on the 1902 and First Edition Ordnance Survey maps.

TT28

The ephemeral outlines of three possible (unexcavated) pits were evident here.

TT26

Five parallel ditches, 0.6m wide, were aligned NE–SW and roughly 3.5m apart. Sample excavation showed them to be very shallow (50–100mm). One possible post-hole, of 0.35m diameter, and the butt-end of a possible linear feature or oval pit were recorded but not excavated.

TT24

(Fig. 13)

F.26 A 2m-wide ditch, oriented NNW–SSE, had relatively regular edges and a sub-rounded base (*057*). It was filled with mid–

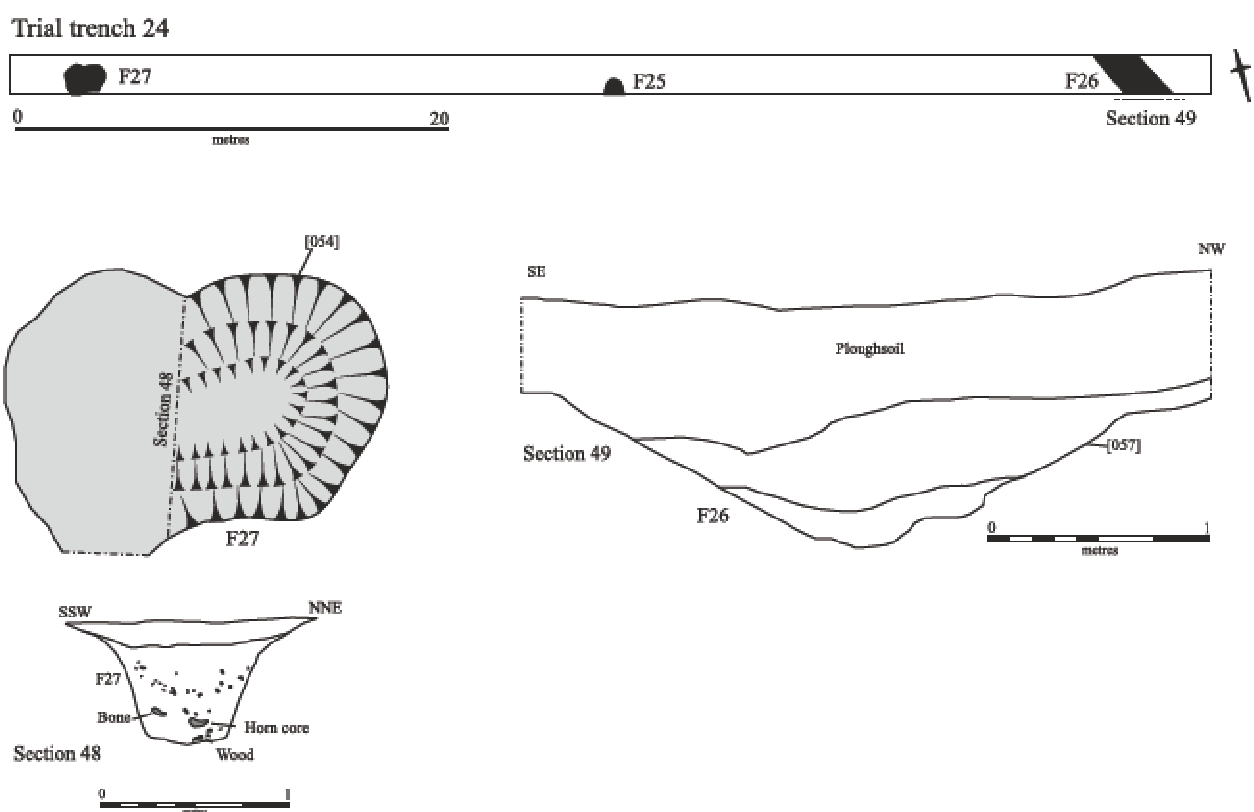


Figure 13 TT24, plans and sections of selected features

dark brownish grey sandy silt loam (*058–9*) and produced no finds. This ditch was visible in the unharvested sugar beet as a prominent ridge, which met another ditch oriented roughly NE–SW.

F.25 An oval pit (*053*), excavated against the southern trench edge, was 0.25m deep and up to 0.80m wide. It had concave edges and a rounded base. The pit was filled with a mid–dark, slightly reddish brown sand loam (*052*) which contained earlier Iron Age pottery and bone fragments and a possibly dressed, perforated fragment of chalk. A possible animal burrow had destroyed the upper half of the pit.

F.27 An irregular pit (*054*) was 0.65m deep and 0.90–1.20m in diameter. Its splayed upper edges fell steeply to a flattish base 0.40m wide. A tertiary silty loam infilled the upper 0.20m of the pit (*056*), beneath which were the dirty backfill layers of the pit comprising reddish brown sand mixed with mid-grey silt loam (*055*). The fill became much darker with depth and contained ill-sorted medium-large flints. The lower *c.* 0.40m contained considerable quantities of bone (including horn core) and small fragments of slightly desiccated wood, preserved by the relatively high water table.

The similar nature of the two pits, F.25 and F.27, suggests contemporaneity. That one of these contained pottery dating to the Iron Age increases their significance in an area hitherto devoid of findings of this date. The cropmark maps of this area reveal extensive field systems and possible enclosed paddocks which were previously thought to be part of the known Romano-British occupation centred *c.* 100m further south. There is thus a strong probability that these enclosures had their origin in the Iron Age. It remains unclear whether the large roughly N–S field boundary ditch represents an element of the former field system or is part of the more recent agricultural landscape.

TT23

F.30 A 3.0m-wide unexcavated field boundary ditch, aligned NW–SE, contained a mid-brownish grey silt loam fill. No dating evidence was apparent.

The clear cropmark of a NW–SE ditch corresponded with a substantial feature surviving in the base of the trench.

TT21

The westward 70m of this trench provided an impressive section through the infilled 'roddon', or former courses of the River Ouse. Two channels were apparent where the high- and low-velocity silting sequence contrasted with the rich, organic mud and peats of the stagnant or sluggish channels. Despite a wealth of environmental evidence obtainable from this section no archaeological contexts or remains were evident to enhance this information. A single wooden 'upright' (not recognisable as oak or ash) was noted after heavy rain had caused the exfoliation of one part of the section. This was examined to see if it had been worked or placed in that location. All that was evident was that a vertical branch had collapsed downwards and in so doing had split longitudinally, the upper half wedging itself against the split lower half. This was proven by the well-preserved bark remaining attached to both upper and lower parts. Had this been a structural member it is unlikely that the bark would be attached in this way. Despite the discovery of a Romano-British docking structure *c.* 100m to the southwest of TT21, no archaeological evidence came from the machined section through the roddon silts. No further archaeological evidence was found between Stuntney and Ely.

IV. Transect lithics: character, chronology and density

(Figs 14 and 15)

Tables 2 and 3 show the basic densities and character of the worked and/or burnt flint along the transect as a whole. For the purposes of this discussion, a particular emphasis is placed on this material, not least because several of the sites and their associated features were revisited for mitigation, enhanced survey and environmental sampling as part of a second phase of work (below). The data here discussed provide a background to that work, but are significant in their own right as a basic index of landscape patterning.

At a general level, the vast majority of the worked flint recovered from the pipeline evaluation is likely to be derived from sources/deposits which occur within the

Category	*Trial trench/test pit number*								
	23	*24*	*26*	*30*	*31*	*32*	*33*	*34*	*36*
Primary flakes/blades									20
Secondary flakes/blades	2	1	1			1	6	2	39
Tertiary flakes/blades		2	1		1	2	9	2	101
Serrated flakes/blades									10
Blade/narrow flake cores									9
Discoidal cores									1
Multi platform cores									2
Endscrapers									12
Sub-circular scrapers									3
Irregular scrapers									3
Laurel leaves									1
Leaf shaped arrowheads									1
Axes/adzes									1
Hammerstones									1
Chips									33
Chunks									18
Burnt flint wt. (g)	10	140		343	31		15	42	11,658
Totals (excl. burnt flint)	**2**	**3**	**2**	**-**	**1**	**3**	**15**	**4**	**255**
Area (square metres)	200	200	200	100	4	100	100	4	320

Table 2 Composition of lithic assemblages from transect TT23–TT36

Category	*Trial trench/test pit number*								
	37	*40*	*41*	*45*	*47*	*48*	*49*	*51*	*63*
Primary flakes/blades	9		1		6			2	4
Secondary flakes/blades	42	7	3		31		3	14	23
Tertiary flakes/blades	68	9	5	3	39		1	11	16
Serrated flakes/blades	5	1			1				
Polished flakes	2								1
Blade/narrow flake cores	8				3			1	1
Discoidal cores									
Multi platform cores	2				4			2	2
Endscrapers	8	1			2			1	
Thumbnail scrapers	1				2				1
Sub-circular scrapers					1				2
Irregular scrapers	6	2			1			2	3
Borer	1								
Plano-convex knife	1								
Hammerstones						1			1
Chips			35	3	2		26		12
Chunks			14	2			5		10
Burnt flint wt. (gms.)	12,795	14	82	29	934	7	36	5217	117
Totals (excl. burnt flint)	**153**	**20**	**58**	**3**	**92**	**1**	**35**	**33**	**76**
Area (Square metres)	74	4	100	4	300	100	200	100	400

Table 3 Composition of lithic assemblages from transect TT37–TT63

region, principally the Isleham drift geological series (Seale 1975). This yields water-transported nodules, often with an abraded cortex, which can vary considerably in size, form, colour and composition. Despite problems of identification caused by incipient or advanced cortication, the majority of assemblages contain a range of materials; from fine-grained, homogeneous stone through to mottled pieces with major inclusions, and from black to brown and grey/white. Further to the drift-derived material, problems of specific sourcing also apply to flint from upper chalk deposits in the area, and to an homogeneous black flint, often with a distinctive thick, white cortex. This was recognised in a number of assemblages, particularly those with diagnostic later Neolithic/Early Bronze Age artefacts, and may perhaps be derived from a quarried/mined upper chalk source.

Overall, the distributions confirm and extend the observations of the Fenland Survey. No significant prehistoric remains were evident in any of the trenches and test pits between Stuntney and Ely. In other words, there was no sign of prehistoric activities that might be expected to leave a clear lithic signature.

Material was found on the sand and chalk lands between East Fen Drove, Soham and Isleham. Densities around East Fen Drove (TT24) were low, comprising no more than a few secondary and tertiary flakes, and a few pieces of heavily burnt flint. Although a later date for stoneworking cannot be ruled out entirely, these are likely to be residual elements in two irregular pits, one of which also contained Early Iron Age pottery and bone fragments. These pits hint at a longer history behind the supposed Romano-British field systems that are locally visible as cropmarks. There is, however, little to suggest that the immediate area was a focus for activity in earlier phases.

The same 'background' persisted for *c.* 600m to the south-east before volumes of worked and/or burnt flint began to rise, coincident with a change in underlying geology from gravels to chalk. A significantly different profile can be traced around TT36 and TT37. TT37 traversed part of the peat filled former course of the River Snail. The machining and hand excavation of peat and organic muds and silts demonstrated the survival of large quantities of waterlogged wood, though none of it showed signs of working. Worked and worked/burnt flint were also common, and were found in association with animal and human bone fragments and with sherds of Neolithic/Early Bronze Age ceramics (see Chapter 5).

TT36 was located within a pasture on the west bank of the river and revealed a truncated soil sequence consisting of a shallow depth of peaty topsoil (0.20–0.25m) lying above the plough-scarred natural chalk. Truncation here had removed almost all features save one (F.22), a sub-oval pit (0.95m x 0.75m, with a maximum depth of 0.3m). Remarkably, the four litres of fill recovered from the half-section yielded *c.* 3.6kg of burnt flint. High densities amounting to 6.5kg of burnt flint were also recovered from spoil heap samples taken at 10m intervals along the line of the trench. In all, over 24kg of burnt flint was recovered from the two trenches. In sharp contrast to the patterns found on many later prehistoric sites, as much as 70–80% of this burnt flint retains scars and surfaces which indicate that it had been worked prior to burning.

Such high densities of burnt/worked flint can be compared with the unburnt lithic assemblages. Excavation in these two trenches resulted in the recovery of 457 pieces of worked stone, almost all of which was flint. The only exceptions to this pattern are two flakes of a rather more dense, but nonetheless workable, chert, which occurred in TT36. With the exception of a polished flint axe fragment recovered from F.6 in TT37, much of the flint is likely to be derived from drift deposits in the area. Current problems with the characterisation of flint mean that the precise provenance of the axe fragment is difficult to determine. However, the size of the fragment suggests that the raw material for the blade was probably derived from primary chalk deposits.

The technological profile of the combined material from TT36/7 suggests a particular emphasis upon blade and narrow flake production. Fine tertiary blades occur in considerable numbers, and there are many narrow flakes with parallel scars running down their dorsal surfaces. Out of a total of 169 tertiary removals, 68% could be classified as blades/narrow flakes, the remainder being more irregular in morphology. By comparison, out of a total of 89 secondary removals, only 38% could be classified as blades/narrow flakes. Many of these pieces retain evidence for careful preparation and trimming of platforms prior to removal, and the vast majority have thin, feather-like terminations. The contrast between secondary and tertiary percentages probably reflects the nature of the reduction sequences involved (*i.e.* a greater concern with the morphology of removals once the cortex had gone) and/or a tendency to preferentially select tertiary pieces with regular edges for use. This idea gains some support from the fact that (macroscopic) evidence for limited unifacial retouch or heavy edge wear is present on 28% of tertiary removals but only 11% of secondary pieces. Beyond the contrast, these figures are high, and reflect the consistent use of largely unmodified flakes and blades.

In addition to tertiary flakes and blades, there are high frequencies of material from other stages in several reduction sequences. Removals from earlier stages of blade/narrow flake core working are present, as is debris from the working or production of other tools. Core trimming and rejuvenation flakes, platform crest trimming pieces and small (incidental) bladelets came from both trenches. Also present are more irregular secondary flakes with relatively large amounts of cortex on their dorsal surfaces. This suggests that, rather than being restricted to the simple working of cores that had been produced elsewhere, the assemblages reflect secondary preparation and reduction. This is supported by the evidence of the cores themselves. These take a variety of forms; ranging from crude, irregular pieces with unprepared platforms, through to examples which reflect a high degree of precision and care in platform creation and maintenance. These latter forms include single platform blade cores. Many of these are typical of Clark's class A1 and A2 cores, although there are also several examples with opposed platforms (Clark *et al.* 1960). Significantly for the date of the material, similar cores were identified in the burnt component from both trenches.

A further class of waste flakes was also identified. These take the form of wide, circular or sub-circular pieces with very acute platform angles and heavy platform faceting. Most have a thin, slightly curving profile, and frequently possess opposed scars on their dorsal

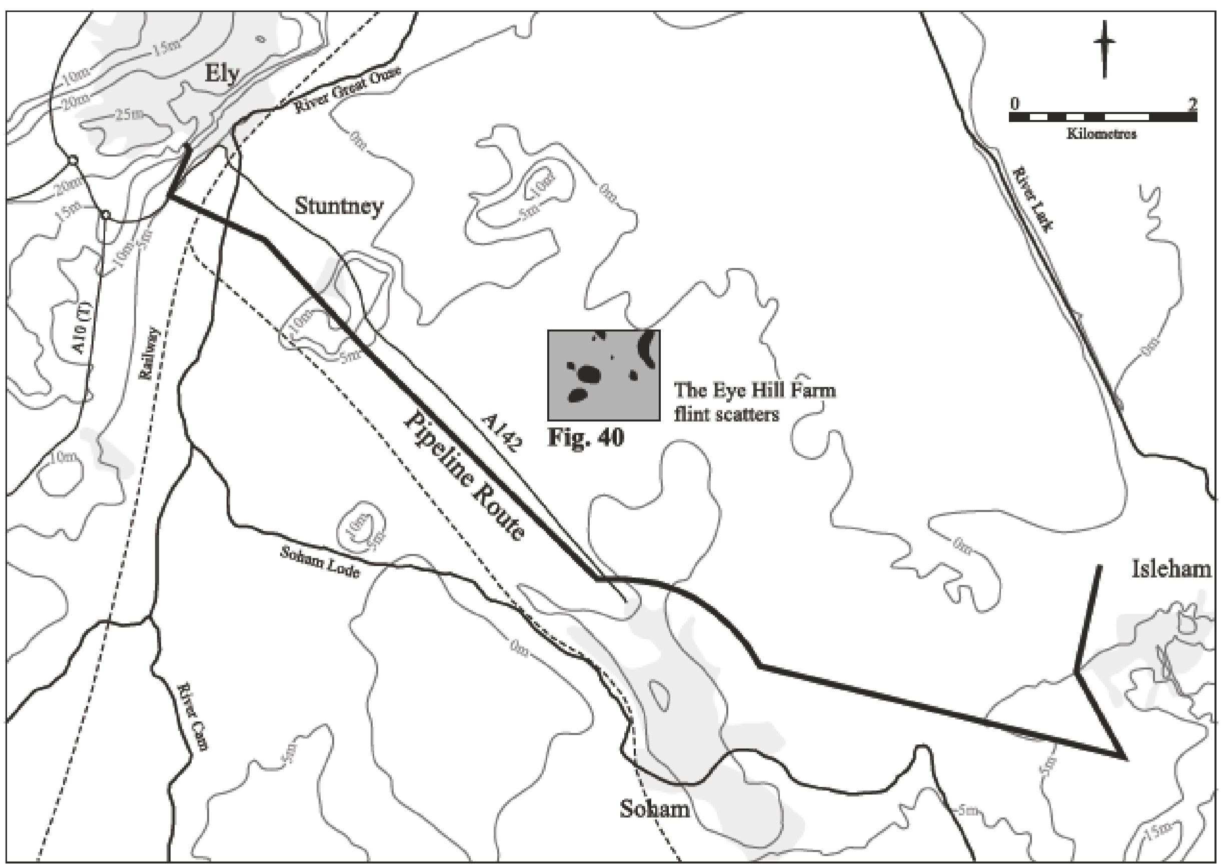


Figure 14 Location of Eye Hill Farm scatters in relation to the pipeline

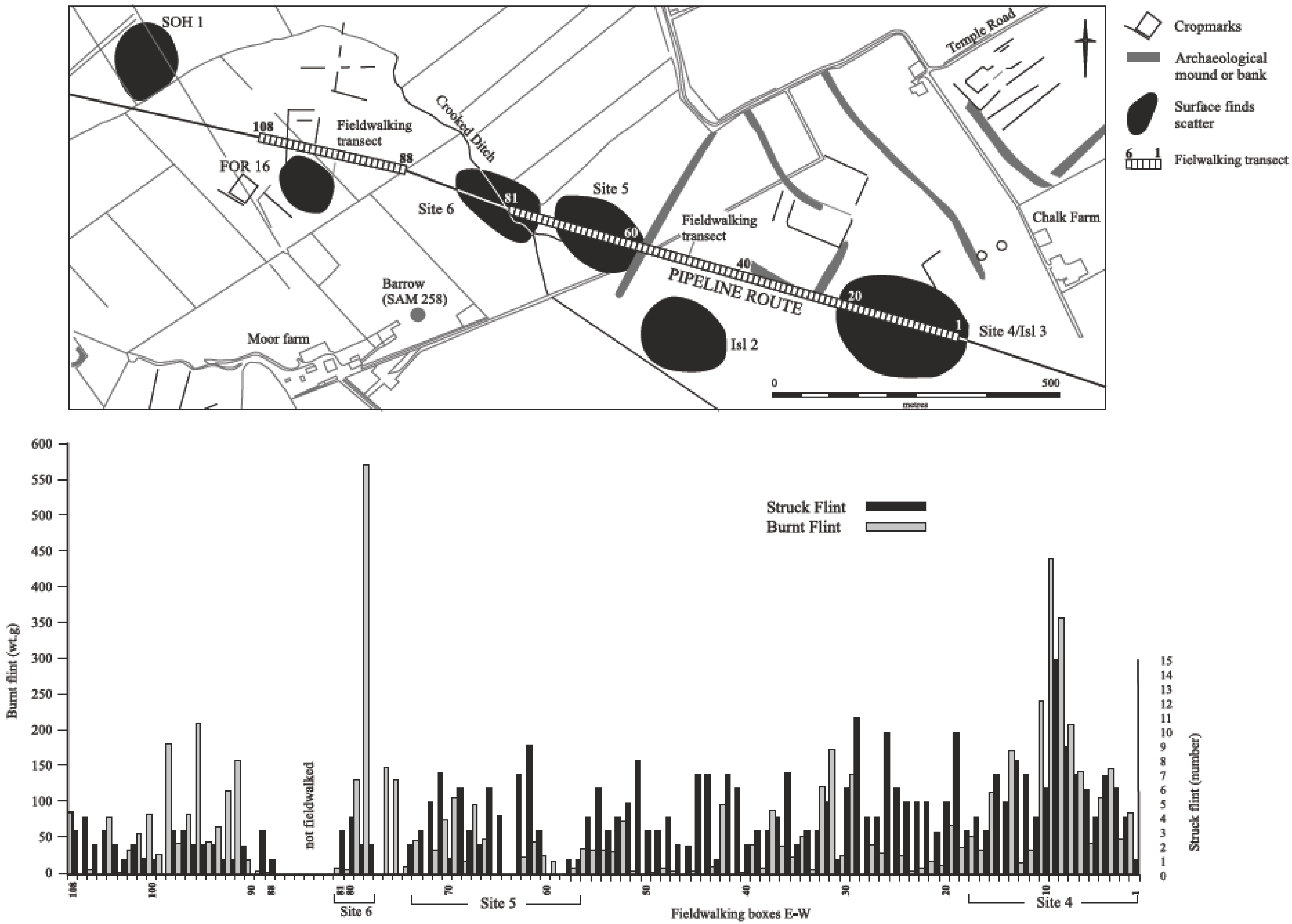


Figure 15 Isleham Sites 4–6: fieldwalking transect and frequency distribution of flint and burnt flint

surfaces. Flakes with these characteristics could be produced where cores were discoidal or simply worked from a number of platforms. However, similar forms are frequently generated during the thinning and trimming stages of working on large bifacial tools. Such activities also tend to result in the creation of smaller flakes with similar morphologies, and it is interesting to note that these too are present in some number. For that reason, it seems likely that activities in the area also included the secondary and tertiary stages of bifacial tool reduction. Once again, flakes with these characteristics were found in both trenches.

Retouched artefacts include a small number of serrated and otherwise retouched/utilised blades, together with more irregular flakes which appear to have been unifacially retouched, or to have sustained limited edge damage through use. The most common artefact recognised was the scraper. These are predominantly endscrapers, with medium invasive retouch around the distal end of the flake or blade. In a few cases, the retouch extends a short distance along the sides of the flake, and in others, a rather more disc-like appearance has been achieved, particularly where the original parent flake was squat and broad. Some of these scrapers show considerable signs of wear, and it is notable that the inventories of both trenches include a small number of scraper resharpening flakes. Other tool forms include complete and fragmented artefacts with bifacial flaking, including a laurel leaf and a fragment of a thin, bifacially flaked piece, which was probably some form of arrowhead. Taken together, the high frequency of blades and narrow flakes, of cores with parallel scars, and of retouched artefacts all suggest a date in the earlier Neolithic.

Trial trenches and pits to the south-east, between TT37 and TT47, revealed varying densities. Endscrapers, narrow flakes and burnt flint were identified in the assemblages recovered from TP40 and TT41. These are likely to be similar in date to much of the material identified on the banks of the Snail *c.* 180m to the north-west and, given the small size of the sampled area at TP40, densities are also comparable. Significantly, this immediate location was not identified as a visible scatter during the earlier stages of the Fenland Survey.

The situation changes in the vicinity of TT47, which cut across a flint scatter that had been previously mapped (Hall 1996). Prior to trenching in this area, grid fieldwalking of the scatter was undertaken on a 10m-wide corridor over a distance of 150m. Collection commenced at the eastern end of the trench (Box A) and worked west (to Box O). Unfortunately, field conditions were particularly poor and this had a clear influence on recovery rates, with only thirty-nine pieces of worked flint recovered from the surface. With these included, a total of 122 pieces of worked flint, and *c.* 1kg of burnt flint were recovered from TT47. Once again, the presence of two endscrapers and a number of regular, well-made narrow flakes and blades suggests an earlier Neolithic date for at least some activity in the area. However, the assemblage also contains a majority (62%) of flakes with rather different characteristics. These tend to be less regular in morphology, with platforms that are themselves more irregular and often unprepared. A number of these secondary and tertiary pieces show signs of limited unifacial retouch/heavy edge wear. The assemblage also includes three scrapers with a more squat or disc-like morphology. Like the bulk of the flakes, it is probable that these are rather later in date, reflecting a presence in the final Neolithic/Early Bronze Age. How far this assemblage relates directly to the excavated features is unclear. These included a series of five post-holes and a sub-circular beehive-shaped storage pit (F.13), from which Early Iron Age sherds were recovered. Once again, it is probable that the bulk of the lithic assemblage predates the pit, if not the post-holes.

TT51 lay close to two lithic scatters identified by the Fenland Survey. As far as could be detected from ground level, a sub-circular field depression was cut through by this trench. It was visible as an uneven encircling ridge, one of many evident in this part of Isleham Fen (see TT63). A machine sondage across the depression revealed the dessicated layers of a naturally infilled pond which is likely to have been available as a water source in prehistory. A 1m x 1m test pit cut through the pond yielded nineteen struck flints and eighteen burnt flint fragments from the secondary and tertiary silts. An irregular linear feature (F.24) was also excavated, with large quantities of burnt flint recovered from a 1.5m wide slot. In all, a total of thirty-four pieces of (unburnt) worked stone were recovered, with characteristics very similar to those identified in TT47 and TT63 (see below). While a minority of artefacts may be earlier Neolithic, the bulk of this small group probably dates to the later Neolithic and Early Bronze Age, and reflects the secondary reduction of cores and the use of (largely) irregular flakes. Horn cores and other cattle bones were also found and such associations broadly support a Neolithic/Bronze Age date. The most striking feature here was the total of over 5kg of burnt flint, much of it packed into the irregular linear feature. While some burnt and unburnt material may have weathered into the pond as it gradually became infilled, the concentration of burnt material in this feature suggests a specific activity associated with quenching the stone itself and/or using it for heating.

Despite the close proximity of several known scatters and the cutting of eleven 2m x 2m test pits (TP52–62), the line running north from TT51 revealed little or no material, densities only picking up again at TT63, close to the end of the pipeline. Here, the evaluation trench identified a range of pits and other cut features, and a large bone assemblage dominated by cattle. A total of seventy-six worked flints were also recovered, together with a small quantity (117g) of burnt flint. While the assemblage lacked many significant diagnostic artefacts, there was again a sense of a 'mixed' collection reflecting more than one episode or phase of activity. This was reflected in the presence of two endscrapers alongside more irregular forms, and by the limited number (nine) of blades/narrow flakes when compared to more irregular removals. The technology of the waste material suggests the presence of both earlier Neolithic and later Neolithic/Early Bronze Age stonework, the bulk of it concerned with the reduction of prepared cores and the use of secondary and tertiary flakes. There was little evidence for primary production, nor for the working or maintenance of other distinctive tool forms.

3. Survey and Excavation at Isleham

I. Introduction

(Fig. 16)

Evaluation of the pipeline corridor established the distribution, character and chronology of the archaeological remains that had, in some measure, survived the impact of drainage and ploughing. Where the corridor crossed Isleham, the evaluation provided the basis for the identification of specific 'sites' for more detailed mitigation (Fig. 16). These were:

Site 1: Prickwillow Road
Site 2: Hall Farm
Site 3: Hall Barn Road
Site 4: Chalk Farm South
Site 5: Chalk Farm West
Site 6: River Snail, Fordham Moor

Apart from a recording brief undertaken at Site 3, all sites were subject to fieldwalking, conducted in 10m square collection boxes in the 10m-wide easement corridor, prior to topsoil stripping. A test-pit based artefact survey was conducted at Sites 2 and 6, which had yielded large assemblages of burnt flint during their evaluation. This survey was designed to gain a better understanding of the quantities of burnt flint used at these sites in relation to other artefact categories. The 1m x 1m test pits were machined to the top of the natural substrate, separating different soil layers if present. Two-bucket samples (30 litres) of spoil were sieved through a 0.5mm mesh, leaving the rest of the spoil for hand sorting. This gave a rapid picture of the intensity of archaeological activity during the fieldwork stage, the results providing the detail for how each site was excavated. Where test pits were not investigated (*e.g.* at Site 1), 30 litres of machine-excavated spoil was hand sorted at 20m intervals from the spoil heaps of the stripped easement, serving as a double check on the extent of archaeological remains at points where features were no longer visible in the subsoil.

The primary excavation focus of the mitigation strategy was the pipe trench area within the stripped easement, since all archaeological remains would be destroyed during its excavation. Here, linear features were slotted and pits were half-sectioned or fully exca-

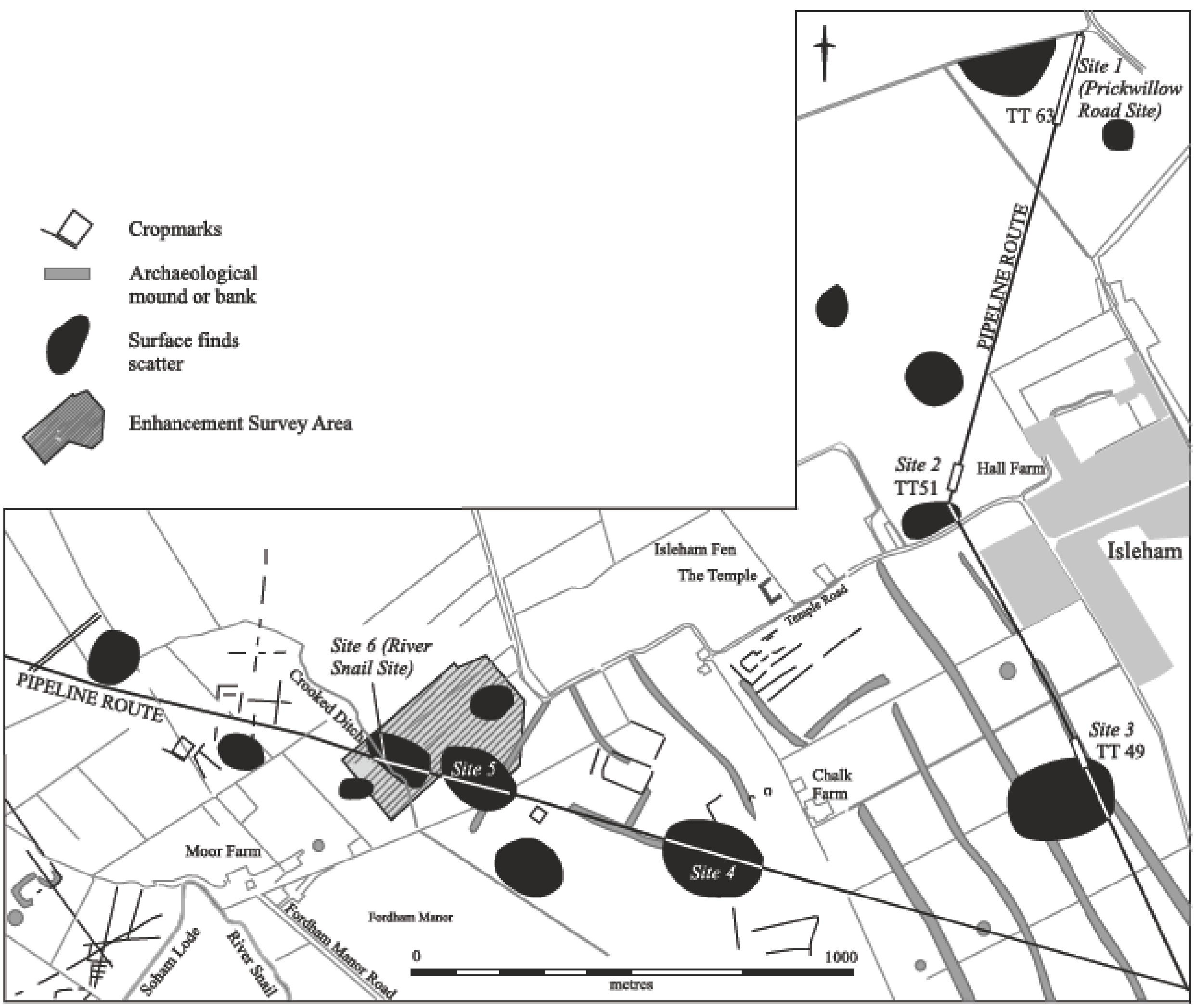


Figure 16 Location of principal sites and scatters in the survey corridor: Eastern Sector

vated. The archaeological features surrounding the pipe trench were sampled or half-sectioned, and any horizontal deposits were investigated in 1m-wide slots. Of the six sites investigated, Sites 1 and 6 were selected for detailed fieldwork since they provided important new information or comparative data for the recently investigated Fenland Management Project sites (Hall and Coles 1994). The remaining four saw rather less attention and are summarised below.

II. Site 2: Prehistoric pond at Hall Farm, Isleham

(Fig. 16)

The dry deposits of an irregular oval pond, roughly 25m x 30m and 1.20m deep, were investigated on the undulating chalk 'upland' west of Isleham, (TL 6353/7416; height *c.* 5.5m OD). Beaker and other Bronze Age pottery sherds were recovered from sondages and test pits through its sediments and from features on its bank (where revealed in the easement), along with 12.5kg of burnt flint. Its origin as a natural pond or an anthropogenic feature remains ambiguous since no dating evidence was found in its primary deposits. The basal organic muds were not conducive to the preservation of other organic matter which Murphy (1994) suggested was the result of toxic conditions caused by the excrement of grazing animals infilling the base of the pond. No evidence of Late Glacial molluscs was found that might have suggested a periglacial origin, but this could also be due to the chemical alteration of the basal muds as described above. If not a re-cut natural feature, modifications to its fills and their contents suggest that it may have been entirely man-made. Molluscan evidence from sediments at higher levels (0.50–0.90m depth) indicated open country grassland, some species characteristic of shaded conditions (probably around the edge of the pond) and a small freshwater assemblage (*ibid*.).

Archaeological evidence derived from the 0.80m-deep upper sediments, from which the bulk of the burnt flint assemblage was recovered. These upper sediments were excavated in 0.10m spits to identify significant levels of activity and this was largely found to occur *c.* 0.50–0.80m from the top of the infilled pond. The lowest 0.40m was devoid of artefacts where examined.

A mixed layer of slowly-formed weathered deposits, which also produced burnt flints (although in much-reduced quantity), overlay this archaeologically active horizon. A small charcoal-rich gully (containing a sherd of Bronze Age pottery and burnt flints) and a few chalk-packed post-holes cut through the upper pond deposits and suggested that the pond was probably infilled by the end of the Bronze Age.

Amongst the ninety pieces of worked flint recovered, there are very few strongly diagnostic pieces. Waste flakes suggest the trimming and reduction of cores with more than one platform, though many are relatively small and cannot be taken as entirely reliable indicators of technology. The three irregular scrapers, all retouched flakes with a steep angle, are also difficult to date, save for noting that they would not be out of place in Bronze Age contexts. A few NW–SE aligned linear features, evident on the north side of the pond and cutting through its top fill, contained medieval pottery and may relate to the manorial complex of Hall Farm, 200m east of Site 2.

Categories	*Field survey No.*	*Excavation No.*
Primary flakes	3	
Secondary flakes	28	16
Tertiary flakes	22	13
Retouched flakes	4	
Polished flakes		
Blade/narrow flake cores		
Discoidal cores		
Multi platform flake cores	1	
Endscrapers		
Thumbnail scrapers		
Sub-circular scrapers		
Irregular scrapers	2	1
Leaf shaped arrowheads		
Transverse/chisel arrowheads		
Barbed and tanged arrowheads		
Axes/Adzes		
Chisels		
Fabricators/Rods		
Borers		
Hammerstones		
Totals	**60**	**30**

Table 4 Lithic categories from survey and excavation at Site 2

III. Site 3: Hall Barn Road, Isleham

(Fig. 16)

Two pipeline route evaluation trenches (TL 6383/7353) were excavated across the mapped north-east edge of a Romano-British pottery and tile scatter. Two contemporary shallow ditches, possibly part of the outfield system of a small Romano-British farmstead which lay 100m to the west in the centre of the scatter, were investigated. Construction mitigation in this area recorded these and associated features in plan. Three linear ditches and two pits were revealed. One shallow NW–SE ditch was recorded over a distance of 60m. Two perpendicular ditches joined it on its east side, creating a plot approximately 40m wide. One of these had been sample excavated in the evaluation trench and had produced a sherd of abraded Romano-British pottery. The two pits did not produce any finds.

Almost central to the stripped easement was a large depression filled with dark humic silty sands. Given its proximity to the dry pond of Site 2, the deposits were carefully machine excavated in the hope of recovering further evidence of prehistoric, or later, activity. The depression proved to be relatively shallow (<0.40m) and archaeologically sterile.

IV. Site 4: Chalk Farm South, Isleham

(Pl. III; Figs 17 and 18)

The stripped easement at Site 4 (TL 6295/7335; relative height: 5m OD) yielded very few prehistoric features, and those that did survive were heavily truncated by modern agriculture and medieval quarrying. Two Iron Age storage pits containing reasonably large ceramic assemblages were found, indicating settlement in an area that previously lacked evidence from this period. The main body of features related to medieval quarrying around a contemporary field boundary, the pits and ditches of which contained a high density of redeposited prehistoric lithics.

Field survey

Field survey in the immediate area recovered *c.* 160 pieces of worked stone with a mean density per fieldwalking unit of 6.23 and a maximum density of fifteen pieces (from Box 9 in the centre of Site 4). Rather more varied in terms of density, but broadly comparable to the worked flint distributions, is the spread of burnt flint across this area. Towards the western edge of the site, burnt flint occurs in relatively low densities, often *c.* 50g per sampling unit. Further to the east, the volume of burnt flint gradually rises, reaching a peak between fieldwalking Boxes 7–10 with a maximum density of *c.* 440g in Box 9.

Much of the surface material from the vicinity of Site 4 is likely to date to the end of the Neolithic and to the Early Bronze Age. Flakes resulting from the secondary stages of core reduction dominate this group, although tertiary pieces are also present. Primary working is more or less absent. Often irregular in morphology, with unprepared platforms and retaining cortex on one edge or at the dorsal end, the vast majority of these flakes appear to reflect the working down of cores, particularly the basic trimming of large crests on platform edges. Other flakes have dorsal scars that run in more than one direction, suggesting that they have been detached from cores with more than one striking surface. Whilst these characteristics are not strongly diagnostic in themselves, particularly given the size of the sample, they do suggest this relatively late date, which is further supported by the presence of a small number of sub-circular scrapers, irregular multi-platformed cores and angular core fragments.

The possibility of more than one episode/phase of activity in the area is suggested by both the condition and the character of some of the waste recovered from the surface assemblage. Although inferences must be drawn with caution, the presence of flaked stone with a heavily corticated white surface offers a contrast with the blue-grey cortication on many of the flakes and core fragments described above. That this difference may relate to chronological variation is supported by the fact that some of the most heavily corticated pieces differ in terms of their technology from the majority. These include a blade/bladelet from Box 7, two blades in Box 19, and an endscraper on a small blade in Box 9. Small though the numbers are, these elements suggest that an earlier component may also be present. This may be supported by the presence of a core rejuvenation flake in Box 2, a by-product of an approach to core maintenance which is not uncommon in earlier Neolithic assemblages. Beyond a simple retouched flake from Box 17, no other formal tools were recognised in the surface assemblage.

Categories	*Field survey* *No.*	*Excavation* *No.*
Primary flakes	3	1
Secondary flakes	60	59
Tertiary flakes	62	80
Retouched flakes	11	6
Polished flakes	-	4
Blade/narrow flake cores	1	-
Discoidal cores	-	2
Multi platform flake cores	11	2
Endscrapers	1	2
Thumbnail scrapers	1	-
Sub-circular scrapers	4	1
Irregular scrapers	6	2
Leaf shaped arrowheads	-	-
Transverse/chisel arrowheads	-	-
Barbed and tanged arrowheads	-	-
Axes/Adzes	-	2
Chisels	-	1
Fabricators/Rods	-	-
Borers	-	-
Hammerstones	-	1
Totals	**160**	**163**

Table 5 Lithic categories from field survey and excavation at Site 4

Excavated contexts

The excavated material from Site 4 comprised 163 pieces of worked flint, most of it recovered as residual material. The assemblage is dominated by small pieces of secondary and tertiary waste which are indicative of core reduction and trimming alongside other larger flakes. Most display a blue-grey corticated surface and where cortex itself is present, it is possible to suggest the Isleham series drift as the general source. Approximately 1.476kg of burnt flint was also recovered during excavations from predominantly later features. Although much of this material was heavily fragmented, *c.* 50% of the larger fragments bore traces of prior working.

The outstanding discovery here was an assemblage of seventy-five pieces of worked flint recovered from pit F149 (*332*: 0.40m deep, 1m diameter). This comprised flakes, six bifacially worked pieces, the butt-ends of two polished flint axes, a serrated flake/blade, a finely flaked horseshoe scraper and a hammerstone among other fist-sized stones that were recovered from the pit (Fig. 18). All of these pieces had white, heavily corticated surfaces similar in character to that identified on material from the surface scatter. Breaks on four pieces reveal the stone to be a dark, homogenous flint with some grey-white mottling. Given the presence of a thin, chalky cortex and the size of individual pieces, some of this material is probably derived from primary chalk contexts.

All of the flakes were generated during the secondary or (especially) tertiary stages of core and tool working.

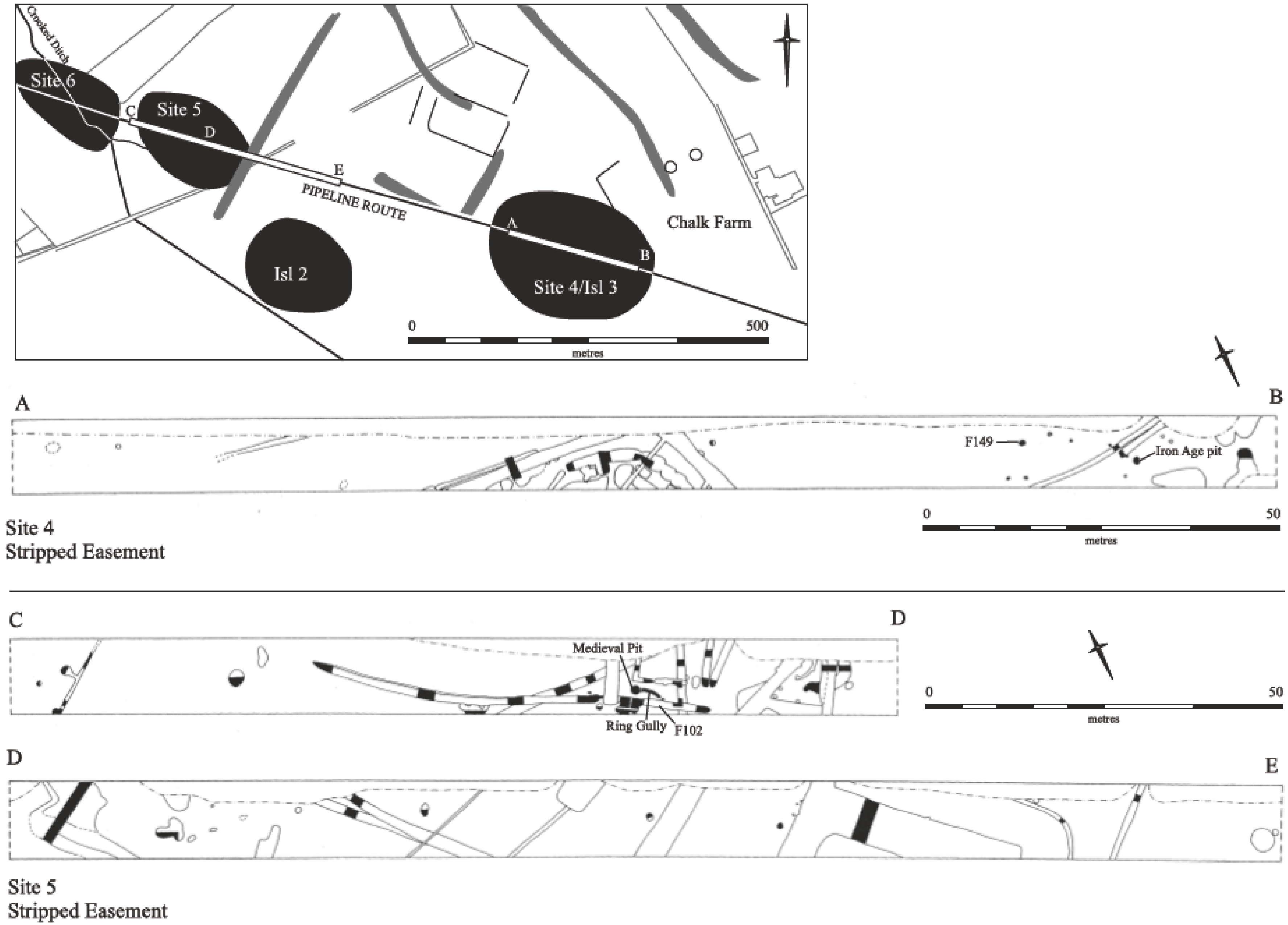


Figure 17 Plans of exposed/excavated features at Sites 4 and 5

That said, a good deal of technological variability is apparent. There are a number of flakes with scars that run straight down their dorsal faces, suggesting removal from a core or tool that was worked in one dominant direction. Some of these are relatively small (*c.* 2–3cm in length) and triangular in section, and may well be the result of trimming the face of a core or the edge of a tool during manufacture. At the same time, there are smaller, squatter pieces, often with faceted platforms, that closely resemble the debitage generated during the process of 'edge turning' that is a feature of the manufacture of bifaces. In one or two cases, this practice has resulted in the (accidental?) removal of a 3–4cm 'chunk' from the edge of the roughout. In addition, the assemblage contains many classic thinning and final trimming flakes. Thin, circular or parallel-sided, with fine facets on

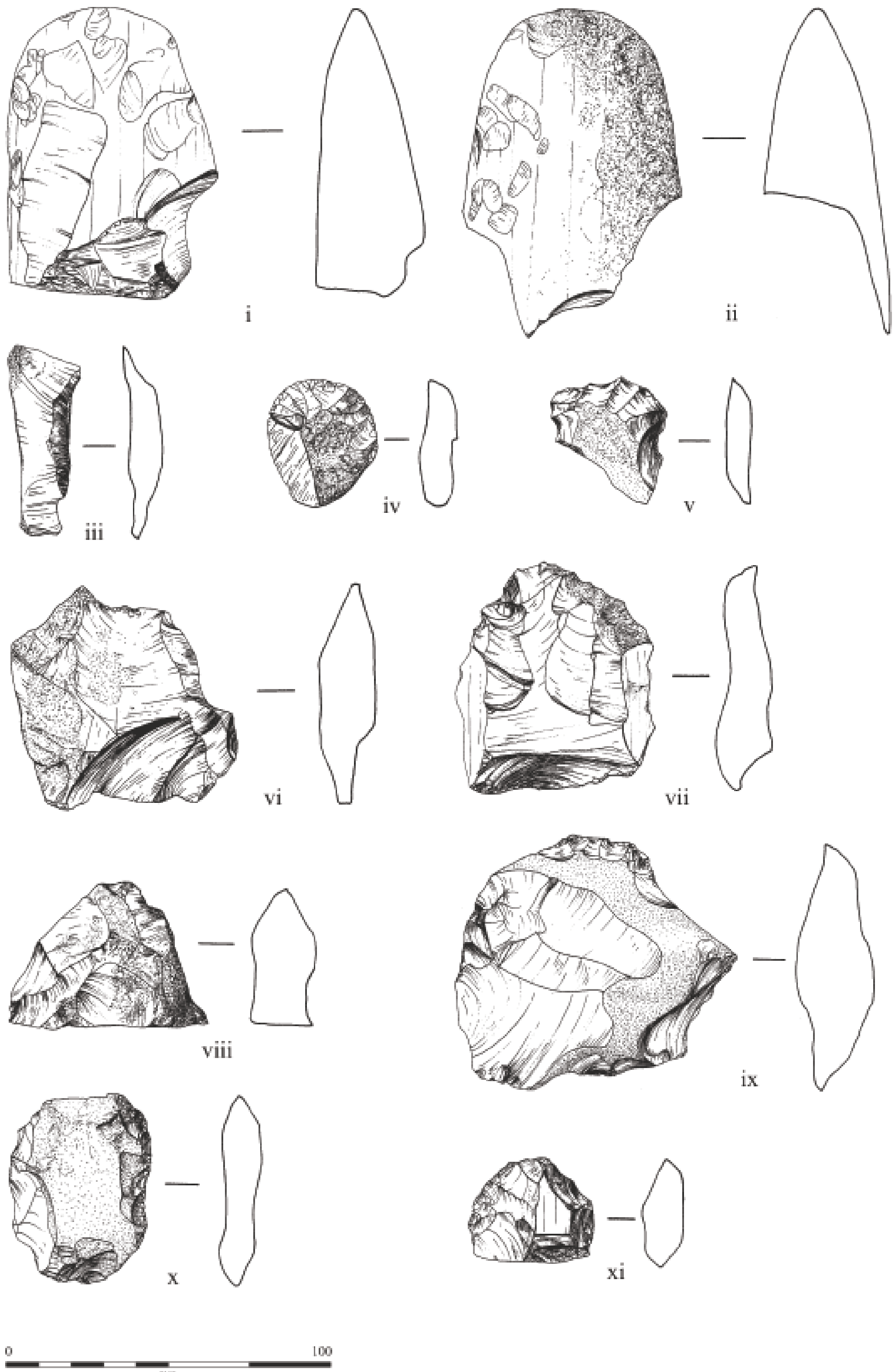


Figure 18 Selected flint artefacts recovered from F.149

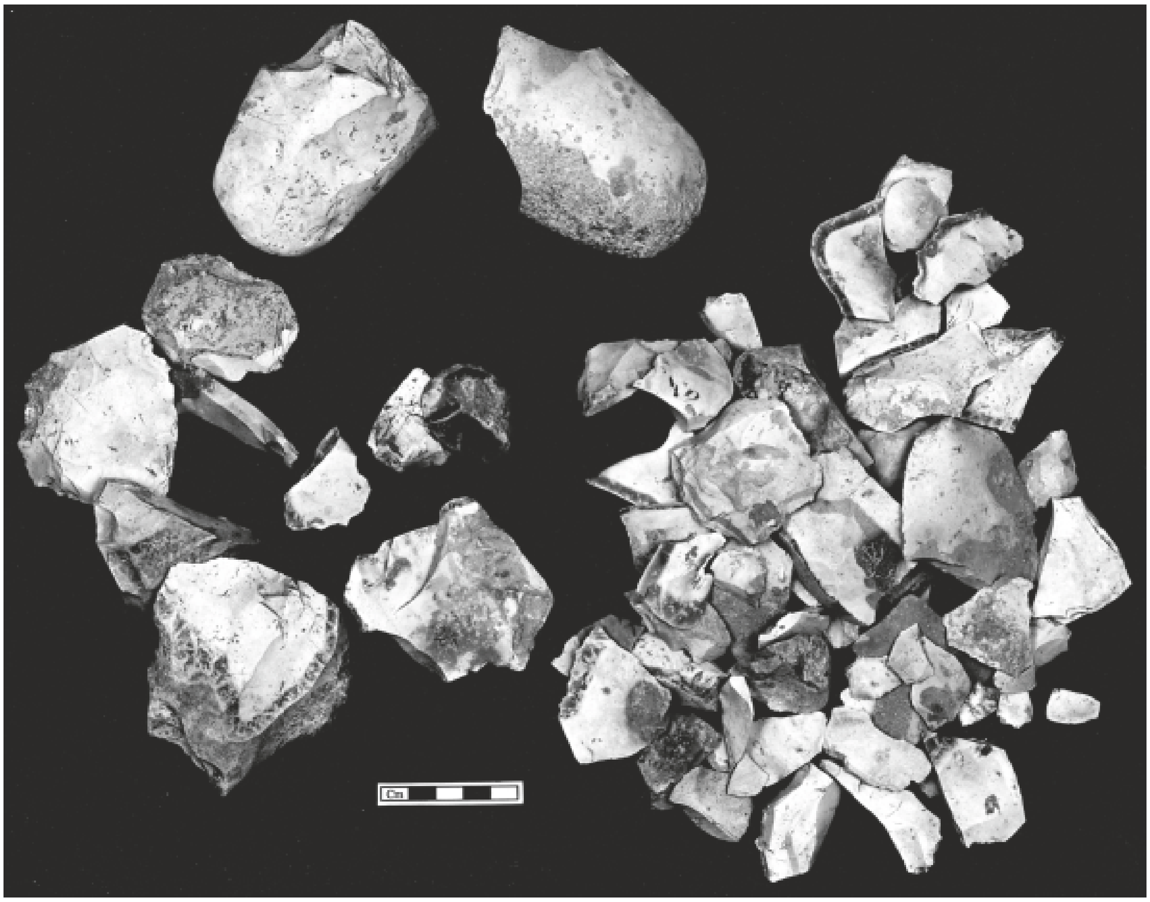


Plate III Worked flint from the 'Stoneworker's pit'

their platforms and dorsal scars emanating from several directions, these are typical of the debitage generated during the later stages of biface production (Bradley and Edmonds 1993; Burton 1980).

This connection with the production, working or reworking of large bifacial tools such as axes is strengthened by the presence of four flakes with evidence for grinding and/or polishing on their dorsal surfaces. It gains further support from the presence of two ground and polished axe/adze butts. The first has a relatively broad butt and rounded lateral edges, leading up to a classic 'endshock' hinge fracture. The second is also broad-butted, but in this case there are traces of narrow facets on both lateral edges. This second axe/adze fragment also appears to have been worked subsequent to breakage, the transverse section serving as a suitable platform for the detachment of several flakes. This post-breakage working has resulted in a good deal of crushing, and hinge fractures emanating from the platform.

A pattern of systematic bifacial working is apparent on six other artefacts. Two of these are relatively crude discoidal cores while a third is possibly the butt of a smaller, bifacially worked chisel or knife that may have broken during manufacture. The remaining three pieces display flake scars on both principal faces, but are too crudely worked to be assigned to any specific artefact category. Despite the presence of a natural concrete/calcine deposit on several pieces, it is clear that three flakes at least can be conjoined. It was not possible to conjoin any flakes to either the axe butts or to the other cores or bifaces.

It is clear that we are dealing here with a selected body of material. Despite the clear emphasis on bifacial working, the relative frequency of flake classes represented in this pit does not correspond to the profile of balanced assemblages created during axe or discoidal core production. Put simply, there are relatively few trimming and final thinning flakes and no flakes indicative of mass reduction or the initial stages of roughout manufacture. This pattern raises several possibilities. Firstly, it suggests a measure of selection; with tool fragments, complete tools and waste from specific forms of production brought together for deposition. Indeed, the presence of the hammerstone may suggest an emphasis upon locating the idea of stoneworking itself during the act of deposition. On technological and artefactual grounds, this assemblage is likely to date to the Neolithic. Although axe typologies are notoriously difficult to apply, the broad butts and all-over polishing seen on the two axe fragments suggests a date towards the earlier part of the period (Manby 1979). Whether or not a similar date can be assigned to the rest of the assemblage remains to be seen, particularly given the presence of discoidal cores and the generally low frequency of blades and narrow flakes. The axes/adzes aside, much of this material would not be out of place at a source such as Grimes Graves (Mercer 1981), so a later date remains a possibility.

V. Site 5: Chalk Farm West, Isleham

Roughly 350m north-west of Site 4, the easement strip revealed a complex plan of ditches, small gullies, pits and post-holes of a medieval site (TL 624/735; relative height: 4–4.5m OD). Site 5 truncated both the edges of a small Romano-British site and a Bronze Age settlement area represented by one shallow 'ghost' gully of a round house that produced Collared Urn sherds adjacent to a ENE–WSW ditch (0.80m deep, 1.30m wide). The features yielded relatively high densities of Late Neolithic and Bronze Age flint, which were clearly residual from the truncated old land surface.

Field survey

Slightly lower densities of worked flint were found in this area, but the results were broadly comparable to those from Site 4: seventy-seven pieces of worked stone were recovered through fieldwalking and test pit survey. By contrast, burnt flint densities were lower here, amounting to *c.* 389g, compared to nearly 3kg at Site 4. In raw material terms the surface assemblage, like the excavated material, shows the use of more than one source (drift and chalk flint, the latter evident as scrapers from Boxes 69 and 73).

As in the surface lithic collections across most of the peninsula, elements of more than one period of activity in the immediate area are present, with a low frequency of earlier Neolithic material and higher densities of later Neolithic/Early Bronze Age tools and waste. The former may be represented by a small number of narrow flakes and blades and by two small narrow flake cores. All display a heavy white corticated surface. The latter may be represented by rather more irregular multi-platform cores and core fragments, such as that identified in Box 67, and perhaps by artefacts such as the sub-circular scraper identified in Box 71. These are generally a mottled blue-grey in colour.

Categories	*Field survey* *No.*	*Excavation* *No.*
Primary flakes	-	3
Secondary flakes	39	124
Tertiary flakes	20	71
Retouched flakes	4	17
Polished flakes	-	-
Blade/narrow flake cores	2	3
Discoidal cores	-	-
Multi platform flake cores	10	17
Endscrapers	-	1
Thumbnail scrapers	-	-
Sub-circular scrapers	1	2
Irregular scrapers	1	3
Leaf shaped arrowheads	-	-
Transverse/chisel arrowheads	-	-
Barbed and tanged arrowheads	-	-
Axes/Adzes	-	-
Fabricators/Rods	-	-
Borers	-	-
Hammerstones	-	-
Totals	**77**	**341**

Table 6 Lithic categories from field survey and excavation at Site 5

Excavated contexts

A further 241 pieces of worked stone and 2.1kg of burnt flint were recovered during excavations, much of it as residual material in later features. Like the surface assemblage, the bulk of the worked flint takes the form of waste flakes, cores and simple retouched tools. Secondary flakes dominate the waste material, many reflecting the working down of small cores. Many of these flakes are themselves relatively small, with lengths of less than 4cm, and most possess an irregular morphology and dorsal scar patterns consistent with their removal from small flake cores with more than one platform. For the most part, cores themselves occur as angular, shattered pieces, although many appear to have been worked to virtual exhaustion or until breakage removed any suitable striking platform. Exceptions to this pattern include the small, heavily corticated core from a medieval or later ditch (F.102) and the biface thinning flakes from the same ditch and from the peaty deposit infilling a river-carved edge on the sloping east bank.

Here too, there is a correlation between differences in the degree of cortication and the technological character of individual pieces. A good example is the small multi-platform flake/bladelet core from F.102 — this was heavily corticated, in contrast to the blue-grey appearance of the secondary waste flakes with which it was associated. A similar contrast can be seen in the redeposited flints from a medieval rubbish pit that in turn probably derived from the truncation of a prehistoric ring gully. Here, the only secondary and tertiary flakes with heavy cortication tend to be long and almost parallel-sided, and they are the only examples which bear traces of careful platform trimming prior to flaking. Again, it must be stressed that differences in the level of cortication alone cannot be taken as a sufficient basis for separating material on chronological grounds, but given the observed technological differences and the presence of a small number of narrow flake cores and core fragments (again as residual material in a medieval context), an earlier Neolithic horizon of activity seems likely.

Simple flakes with non-invasive, unifacial retouch confined to one edge were among the relatively few retouched tools identified at Site 5. In one case, a narrow retouched flake with heavy wear along one lateral edge shows signs of having been reworked at a later date. Beyond these pieces, the dominant tool form is the scraper. Six are represented in the assemblage as a whole, three of which have been fashioned on more-or-less cortical flakes. These scrapers are, for the most part, highly irregular in shape, their working edges characterised by relatively non-invasive retouch scars. The one exception is an end-and-side scraper on a secondary flake from a substantial and securely-dated Bronze Age ditch. As with the other sites along the pipeline route, burnt flint recovered from a variety of contexts is likely to have been derived from the old land surface and from features such as pits and gullies. Much of this material is again heavily fragmented, but some 50–60% of the larger pieces ($\geq$ 3cm) bear scars indicative of prior working.

4. Prickwillow Road, Isleham (Site 1)

I. Introduction

(Pl. IV; Fig. 16)

The evaluation of the Isleham–Ely pipeline identified a predominantly later Neolithic/Early Bronze Age assemblage of worked flint at the head of the linkmain pipe on the north-west side of Isleham, next to a new valve chamber at the corner of Prickwillow Road and Knave's Acre Drove (TL 6379/7510; Fig. 16). Excavation of TT63 revealed pits containing significant quantities of bone (including wild species), but few datable artefacts (Gdaniec 1993). Depositional information in the sectioned features, and the proximity of known flint scatters that produced sherds of Early Bronze Age pottery (Hall's Isleham Sites 6 and 7; SMR 10957, 10954 and 07537), suggested that these features might be part of an intact prehistoric settlement.

The irregular nature of some of the Prickwillow Road pits and their contents encouraged a variety of interpretations regarding both their anthropogenic origin and their antiquity, but a short (eight-day) programme of fieldwalking and excavation established the extent and relative date of the site. Coinciding with the pipeline's designated pipe store and mechanical rock-cutter testing zone, the Prickwillow Road site lay approximately 60m south-west of the Knave's Acre Drove junction, the first proposed area stripped for pipeline operations. The urgency of the completion of archaeological fieldwork was paramount to the engineers and contractors, who in turn generously responded by agreeing to restrict the length of the pipe store and to establish an alternative location for machinery testing (Pl. IV).

II. Field survey

(Figs 19–21)

Bucket samples of spoil (only ploughsoil survived) had been hand sorted at 20m intervals along a 200m long evaluation trench at Prickwillow Road and had shown that Hall's flint scatter sites, previously mapped as being adjacent to the corridor, extended across the pipeline route but were only evident along half of its length (twenty-eight flints were recovered from ten 30-litre samples). Subsequently a 10m wide corridor was fieldwalked, from north to south, in 10m collection boxes over 240m (FW1–FW24).

Ninety-one flints were recovered (a mean distribution of just under four per box); half of the boxes yielded densities greater than four flints. The highest density was identified in FW19 towards the southern end of the transect, which contained eight pieces of worked flint. A further thirty-three pieces of worked flint were recovered from additional ploughsoil bucket sampling following stripping. Figure 16 shows the distribution of flint along the transect, with distinct peaks and troughs which probably represent areas of ploughed-up feature fills or intact pockets of the old land surface. A breakdown of the major finds groups from each of the recovery modes is presented in Table 7, with the percentage of each mode represented in brackets. The nine pottery sherds recovered from fieldwalking were all of post-medieval and later date, whereas those from the excavated contexts were all Bronze Age. Even in these deposits, the sherds were eroded and soft and unlikely to withstand the effects of movement and abrasion in the ploughsoil.

Plate IV Excavation on the pipeline easement

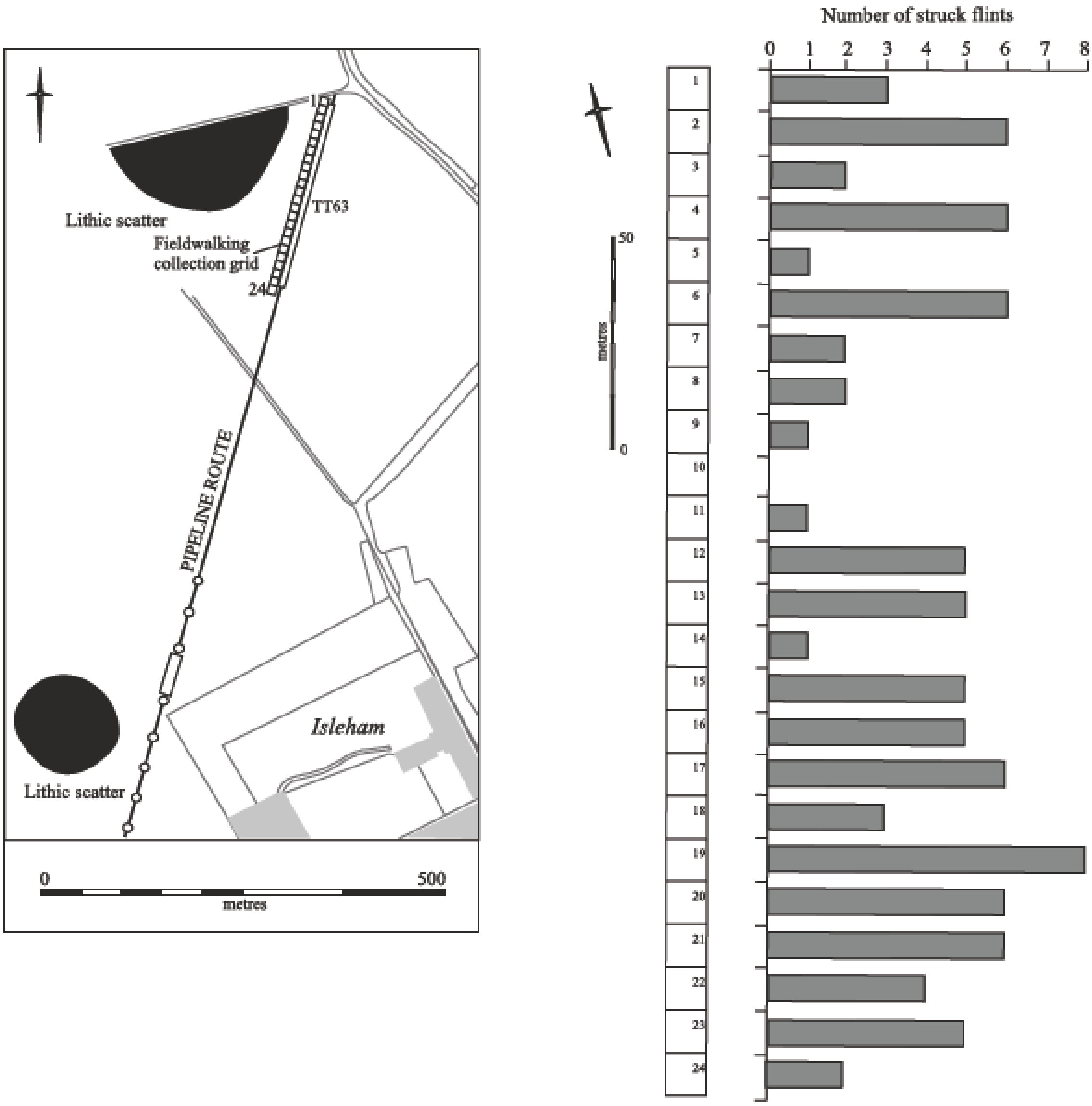


Figure 19 Distribution of worked flint from fieldwalking transect at Site 1, Prickwillow Road (adjacent to TT63)

Category	*Fieldwalking*	*Excavated contexts*	*Bucket samples*	*Totals (100%)*
Burnt flint	15g (5.7%)	249g (94.3%)	-	264g
Flint (unburnt)	91 (29.7%)	154 (50.3%)	61 (20%)	306
Bone	230g (1.5%)	14.6kg (98%)	80g (0.9%)	14.9kg
Pottery	9 (36%)	16 (64%)	-	25

Table 7 Artefact densities by mode of recovery at Site 1

The initial identification of a Bronze Age site was based solely on the quantity and character of flint scatters in this field. While they had previously been mapped as separate scatters with no described inter-relationships it now seems likely that they probably constitute elements of a single 'occupation area' with many internal activity loci, some of them perhaps indicating episodic presences. The topography of this side of Isleham is formed of undulating chalk which becomes more 'hummocky' towards the fen margin slopes to the north, where the fen deposits infill low lying pockets and creeks. The scatters visible on the field surface probably derive from parts of ploughed-out settlements that were located on the higher chalk hummocks, the feature fills and old land surface of which now form part of the thinning ploughsoil.

The fieldwalking assemblage reflects the use of stone derived from both major categories of geological source. Flakes retaining an abraded cortex and displaying variations in colour attest to the use of flint from the Isleham series, but dark, homogeneous chalk flint is also represented. Taken as a whole, the data appear to reflect two distinct phases or periods of activity: the first dating to

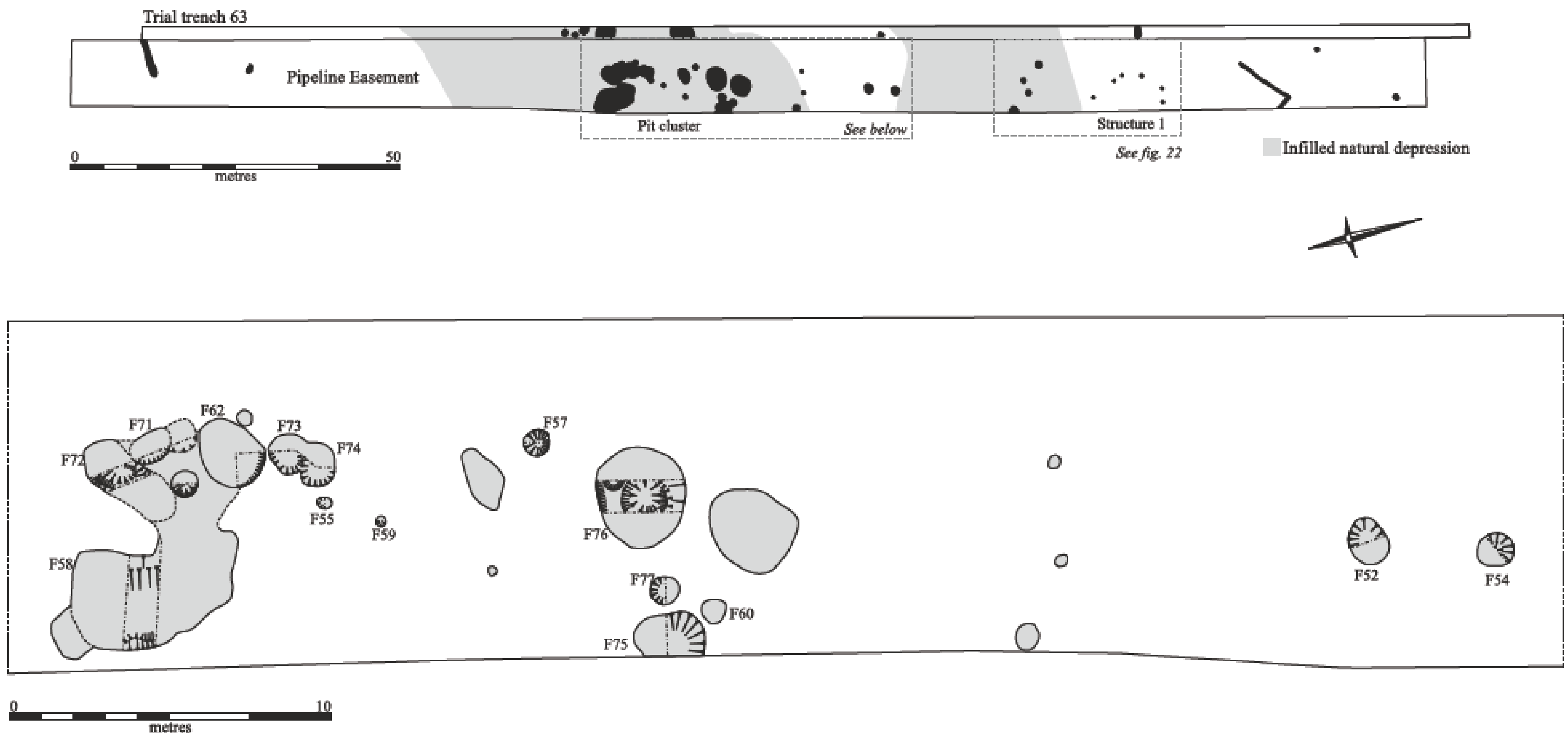


Figure 20 Plan of exposed/excavated features on pipeline easement

Categories	*Field survey*	*Excavation*
	No.	*No.*
Primary flakes	2	1
Secondary flakes	42	44
Tertiary flakes	71	88
Retouched flakes	15	11
Polished flakes	-	1
Blade/narrow flake cores	3	-
Discoidal cores	-	-
Multi platform flake cores	9	3
Endscrapers	2	1
Thumbnail scrapers	1	1
Sub-circular scrapers	2	-
Irregular scrapers	3	2
Leaf shaped arrowheads	-	-
Transverse/chisel arrowheads	1	1
Barbed and tanged arrowheads	-	1
Axes/Adzes	-	-
Fabricators/Rods	1	-
Borers	-	-
Hammerstones	-	-
Totals	**152**	**154**

Table 8 Lithic categories from survey and excavation at Site 1

some point in the earlier Neolithic and the second to the later Neolithic/Early Bronze Age. An earlier Neolithic presence is evidenced by a small number of narrow flakes/blades (*e.g.* from FW12), which show clear evidence for careful trimming and preparation prior to removal from their parent cores. A similar date may also be assigned to the endscraper from FW6 and a relatively crude crested blade from FW2. Later activity is suggested by the presence of thumbnail (FW4) and other sub-circular scrapers, irregular multi-platformed cores and core fragments, and quantities of secondary and tertiary material reflecting similar patterns of working. Many of these flakes have an irregular morphology, large, unprepared platforms and dorsal scars which run across the main flaking axis — attributes consistent with the flaking of relatively crude multi-platform cores.

A later Neolithic date is also more likely for the transverse arrowhead made on light grey flint that was recovered from FW4 and the discoidal core from FW6. A small, bifacially flaked fabricator from FW19 may also date to this phase, although given the particular character of this piece, precise chronological attributions may be unwise. Also present are angular fragments of shattered, irregular cores, a characteristic which becomes increasingly prominent in assemblages dating to the earlier Bronze Age. There are also significant variations in the degree of cortication on pieces, and a few of those with a very heavily corticated surface show signs of having been re-used. Again, this is by no means uncommon on sites dating to the Bronze Age. These characteristics are consistent with Brown's analysis of the Fenland Survey lithics from the adjacent scatters (Brown 1996, 209).

The worked flint excavated from the features and soil horizons (154 pieces) was broadly consistent with the patterns derived from the fieldwalking survey in both technological and raw material terms; again, artefacts that may be indicative of earlier Neolithic activity were present. These included two endscrapers and a retouched blade from a small pit (F.52) and a blade and a polished flake from another (F.61). Earlier Neolithic artefacts were also located within the main pit cluster, including an endscraper and blades from F.58 (Spits 5 and 7). Here, however, the presence of later artefacts suggests a relatively complex depositional history. This later material includes a thumbnail scraper from F.62, a blank for a barbed-and-tanged arrowhead from F.58 (Spit 1) and a relatively crude transverse/chisel arrowhead from F.53. In the case of relatively irregular features such as F.58, it is possible that we are seeing the truncation or modification of earlier Neolithic pits and hollows at some point in the earlier Bronze Age. In most cases, however, we are probably dealing with residual material contained in features that were cut or otherwise created at a somewhat later date. Unfortunately, the overall size of the assemblage from individual features is not sufficient to resolve this question.

Like the fieldwalking collection, the bulk of the excavated assemblage is dominated by tertiary flakes from the reduction and use of cores with more than one platform. Few of these pieces have carefully trimmed or prepared platforms, and the irregular morphology of many flakes suggests a general tendency towards the working of multi-platform cores for the production of flakes of various forms. This is further supported by the common tendency for scars on the dorsal surfaces of flakes to run in more than one direction. Exceptions to this pattern include a small number of flakes with faceted platforms and a curving profile. These probably reflect the flaking, trimming or maintenance of bifacially worked tools, though some at least may have been detached from discoidal cores. Material from this trench also includes a percentage of angular pieces with pronounced flake scars indicative of the smashing or heavy reduction of irregular cores. Given the dates derived from bone in pits on this site, it may be that this crudely flaked material dates towards the end of the time that activities involving stoneworking took place in the immediate area.

Despite the broad chronological range reflected in artefacts and waste, the overall densities of lithic material from Prickwillow Road are relatively low, as are the densities of burnt flint recovered during survey and excavation. In general, they point to the use and discard of a relatively small volume of stone in the immediate area over time. The evidence suggests simple tool use and the routine reduction of cores, rather than any major emphasis upon tool production or core preparation. Since the excavated area lies close to several known scatters dating to the Early Bronze Age (Hall 1996), it may be best to assume that we are dealing here with an area of activity within or on the margins of a larger spread of settlement. The precise characteristics of these activities are difficult to determine on the basis of a small quantity of lithics alone, but it seems that these later phases saw the disturbance of a small amount of material and perhaps even the truncation of one or two features dating to the earlier Neolithic.

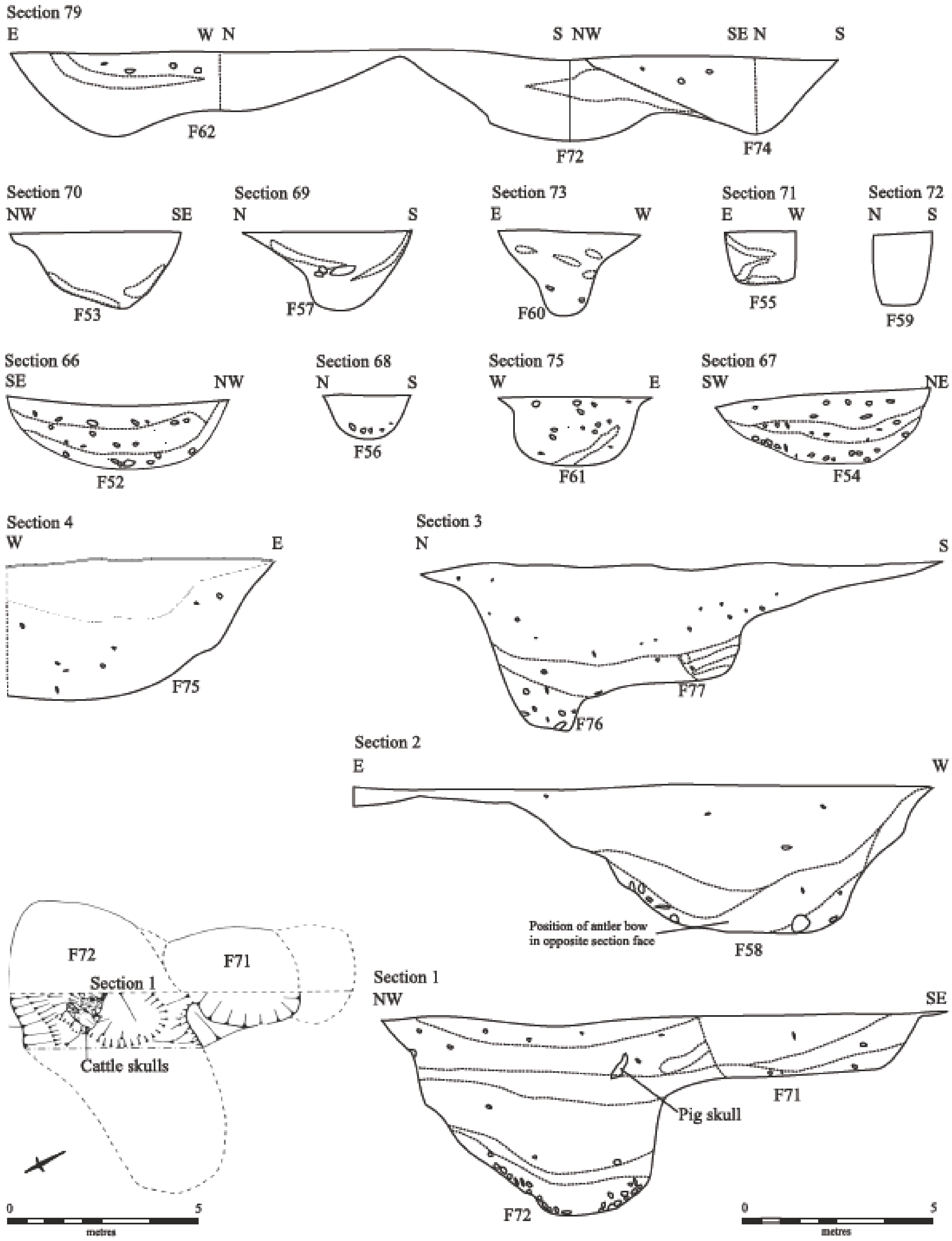


Figure 21 Sections of selected excavated features on pipeline easement

Regional environmental evidence suggests that fairly dense deciduous woodland prevailed here through much of the Neolithic with, perhaps, localised (possibly natural) clearance enabling human exploitation or modification. The presence of these higher slope scatters — contrasting with those hugging the fen margin — begins to suggest that more long-term occupation areas were evolving across the neck of the peninsula in cleared zones above the dense carr woodland of the lower, wetter slopes.

III. Excavated features

Sixty metres south-west of the Knave's Acre Drove/ Prickwillow Road junction, on the north-west side of Isleham, a cluster of pits and post-holes occurred over a distance of 100m in the pipeline easement. Further south again, a post-built structure was evident where six post-holes, arranged in an arc approximately 10m in diameter, occurred against the western limit of excavation. Since the undulating natural chalk rose slightly here and the soil cover reached a maximum depth of 0.25m, no internal surfaces or features survived — the post-holes themselves were virtually ploughed out. The present ground surface of undulating dry chalk land lies between 2.70m and 3.10m OD over the site area, with typical levels of 2.85m OD. The top of the natural chalk shows a depth variation ranging from 2.35m OD in the deepest investigated hollow to 2.90m OD on some of the wide 'plateaux' between hollows.

Time restrictions on fieldwork ahead of construction forced a rapid prioritisation of the contexts, resulting in an excavation strategy that focused on investigation of those features that would be destroyed by the pipeline trenches. Linear slots of 0.5–1m width were excavated across the large features, while attempting 100% excavation of all smaller features. The large features were dug in 0.10m spits to enable later reconstruction of deposits and enable significant artefact distributions to be better understood. Since the depth of the easement strip in the natural hollow (where the pit cluster occurred) was extended by up to 0.20m beyond the construction requirement, this hollow needed to be backfilled and compacted prior to trenching.

The macrobotanical and molluscan assemblages indicate that this settlement was located in a generally open landscape, where cereal processing and consumption are in evidence (Murphy 1996). Bulk samples (an average of 12 litres), taken from the primary fills of nine features, were assessed for their macrobotanical and macrofossil content following processing through a 0.5mm mesh. The flots were all broadly similar in composition, and contained low-moderate charcoal densities. Charred cereal grains (*Triticum*, *Hordeum*) were noted in all samples bar three. Occasional charred weed seeds, including *Galium aparine* and *Rumex*, were also noted.

Mollusc assemblages in almost all samples were dominated by open-country taxa, including *Helicella itala*, *Pupilla muscorum*, *Trichia hispida* gp, *Truncatellina cylindrica*, *Vallonia* spp and *Vertigo pygmaea*. Taxa indicative of shaded conditions occurred at much lower frequencies in most samples, though in F.76 *Carychium* sp(p), *Discus rotundatus*, *Pomatias elegans* and Zonitids were most common, perhaps indicating that this feature was of a different phase. Catholic terrestrial molluscs (*Nesovitrea hammonis*, *Cochlicopa* spp), marsh and freshwater species (*Bathymophalus contortus*, *Bithynia tentaculata*, *Lymnaea truncatulata*, *Succinea* sp) occurred more sporadically.The samples also produced high quantities of recent, intrusive macrofossils (weed seeds, insects, *Cecilioides acicula*, *Candidula* spp).

The pit cluster

(Figs 20 and 21)

The pit and post-hole cluster was located in a shallow, irregular natural depression, approximately 60m long and deeper in its southern half where the buried soils of the old land surface survived to a 0.20m depth below the base of the 0.30m-thick ploughsoil. When revealed in plan, this buried soil was immediately distinctive being a visibly bone-rich, slightly humic, friable loam (*218*), rather than the paler and more compacted marls and silt loams of other depressions. Well preserved within *218* were large meat- and non-meat bearing bones of cow and sheep/goat, some showing marrowing splits and/or dog gnawing. Gnawing marks were also identified on the human humerus (Luff, p.37 below). The buried soil was rapidly hand-excavated to elucidate the presence and plans of features that might have been preserved within it: the long shallow northern slope of the depression retained less than 0.10m of buried soil and contained no features. Over a length of 25m, the southern half was removed in a 0.15m spit (the depth at which the upper edges of features were evident) and formed a tertiary fill for many of them. Beyond this extent, *218* was seldom deeper than 50–80mm. A total of 4.2kg of predominantly animal bones and eight worked flints were recovered from the hand excavation of *218*. While the tertiary fills of the large pits in the cluster were unequivocally derived from *218*, the smaller features did not exhibit the same fill sequence. Artefacts from the large pits are listed in Table 9.

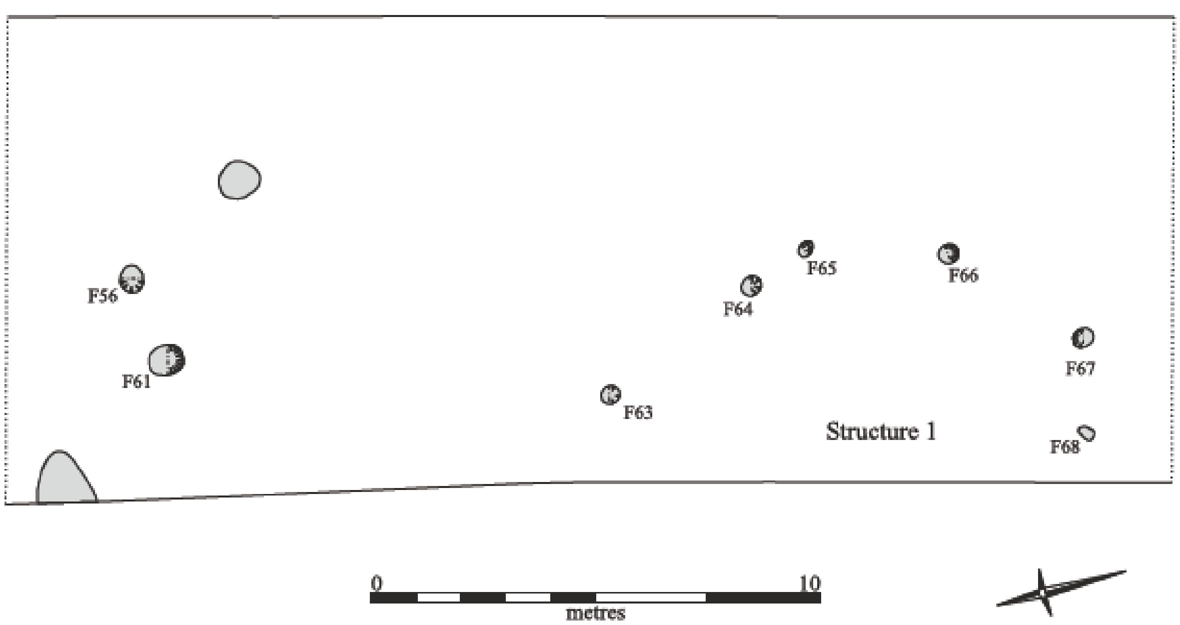


Figure 22 Structure 1, Prickwillow Road (Site 1)

The bone assemblage of 5.7kg extracted from the old land surface contexts is substantial and corroborates the initial assumption from the evaluation that an occupation surface was present here. With the exception of the five pottery sherds occurring in the lowest spit of the tertiary fill of F.58 (Spit 4: *229*, Fig. 19), all other vestiges of the old land surface were aceramic. The worked flint group was formed largely of flakes, although a blank for a barbed-and-tanged arrowhead was recovered from the upper 0.10m (Spit 1) of F.58 *229*.

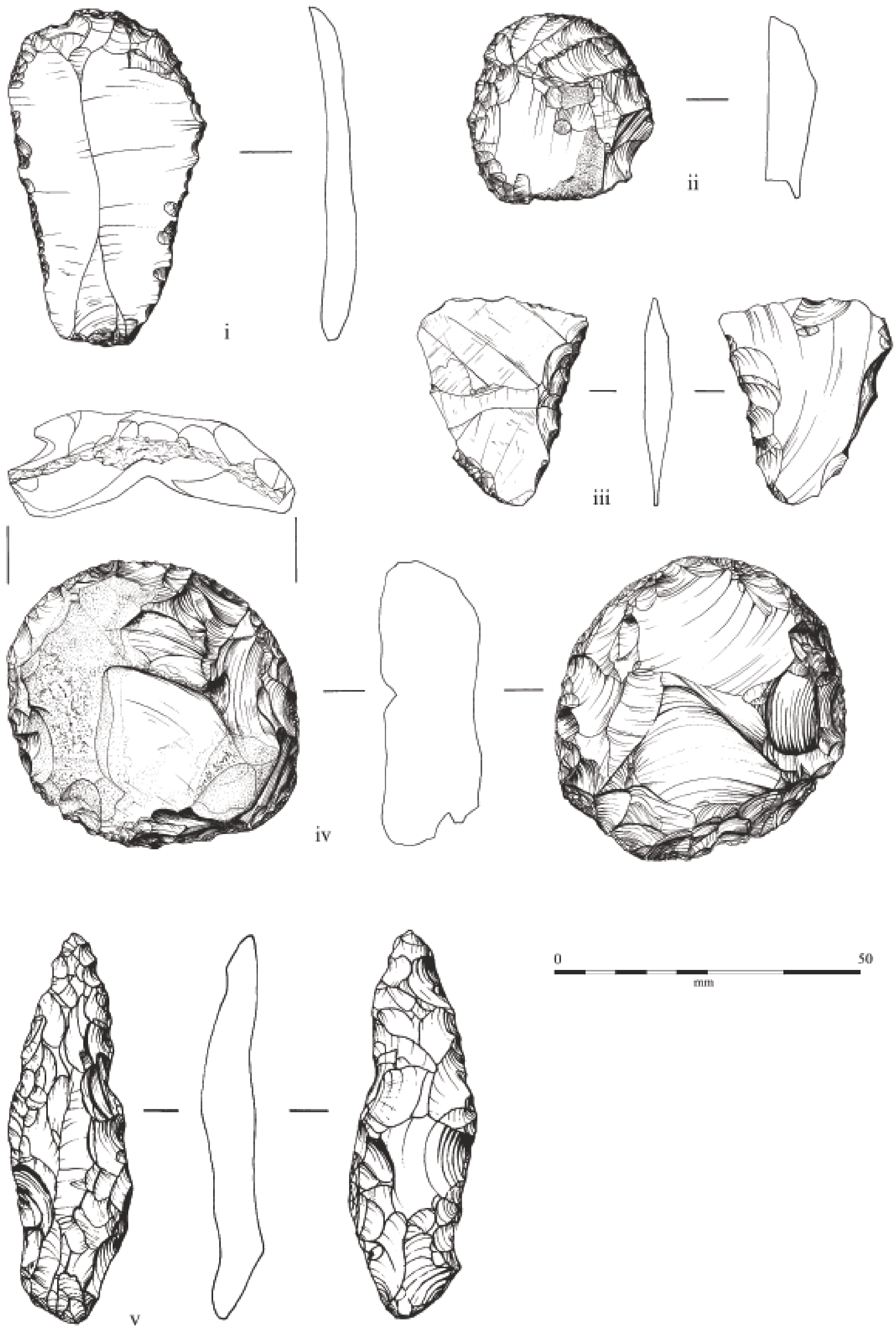


Figure 23 Worked flint from fieldwalking and excavation at Prickwillow Road

Category	*F.58*	*F.71*	*F.72*	*F.75*	*F.77*	*Totals*
Burnt flint	0	0	0	22	0	22g
Worked flint	11	0	2	3	2	18
Bone	900	0	178	291	126	1,495g
Pot	5	0	0	0	0	5

Table 9 Artefact totals from the large pits

Feature no.	*Dimensions (m)*	*Depth*	*Content description*
F.5	1.7x1.0	0.45	Inhumation pit: flexed cow skeleton
F.8	2.0	0.30	Large pit: wild cat?, cattle, pig, flint and burnt stone
F.9	0.45	0.25	Pit: sub-adult bull bones, cow skull and flint
F.10	0.7	0.40	Pit: much animal bone incl. juvenile pig and lamb. Articulated portion of sheep/goat vertebra with decapitation marks
F.11	1.0	0.35	Pit: animal bone fragments
F.12	2.5	0.50	Tree throw? Eroded animal bone frags and flints
F.52	1.3	0.30	Medium pit: LN/EBA pot, abraded bone frags. Burnt and unburnt flint in a midden-like fill
F.53	0.2	0.38	Small pit/post-hole: cow limbs and jaw, flint
F.54	1.1	0.35	Medium pit: Collared urn sherds, flint and burnt flint in charcoal rich fill
F.55	0.4	0.22	Medium pit: bone fragments
F.56	0.46	0.22	Medium pit; no finds
F.57	0.9x0.8	0.42	Medium pit: animal bone frags and flint
F.58	3.0x2.2	0.80	Large pit: dog-gnawed cow and sheep/goat bones, Collared Urn and Beaker sherds in tertiary fill, antler bow and cattle bone in base.
F.59	0.3	0.36	Post-hole: no finds
F.60	0.75x0.85	050	Post-hole: no finds
F.61	0.7	0.35	Medium pit: Beaker, flint and animal bone
F.62	2.3x1.7	0.45	Large pit: no finds
F.63	0.25	0.14	Post-hole: no finds
F.64	0.4	0.16	Post-hole no finds
F.65	0.25	<0.10	Post-hole: 1 flint
F.66	0.4	0.20	Post-hole: no finds
F.67	0.25	0.22	Post-hole: no finds
F.69	1.0x0.2	<0.10	Large pit: no finds
F.71	1.0	0.30	Medium pit: no finds
F.72	3.0x1.7	1.0	Large pit: Cattle skulls in base plus fresh and abraded animal bone fragments; skull of an old pig, cattle pelvis and teeth of juvenile cow.
F.73	1.2	0.45	Medium pit: animal bone with knife cuts and dog gnawing
F.74	1.3x1.0	0.40	Medium pit: no finds
F.75	2.1x1.5	0.73	Large pit: animal bone
F.76	3.0	0.65	Large pit: animal bones and flint
F.77	0.3	0.75	Large pit: horn cores, cow, sheep/goat, pig, dog-gnawed bones

Table 10 Feature summaries for Prickwillow Road

Some of the features of the pit cluster defined a roughly north–south line extending over 22m, with other pits forming 'return angles' at each extremity. Their arrangement appeared to enclose an inner, feature-free, space, as if to define the outer edges of a structure. Although two post-holes (F.55 and F.59) were present in the pit group, it is not clear what form the potential structure might have taken.

Many of the backfilled pits were substantial (*e.g.* F.58, F.72, F.77), roughly 2–3m wide and 1m deep. At least the upper third of each pit was filled with gradually accumulating homogenous soils from the contemporary

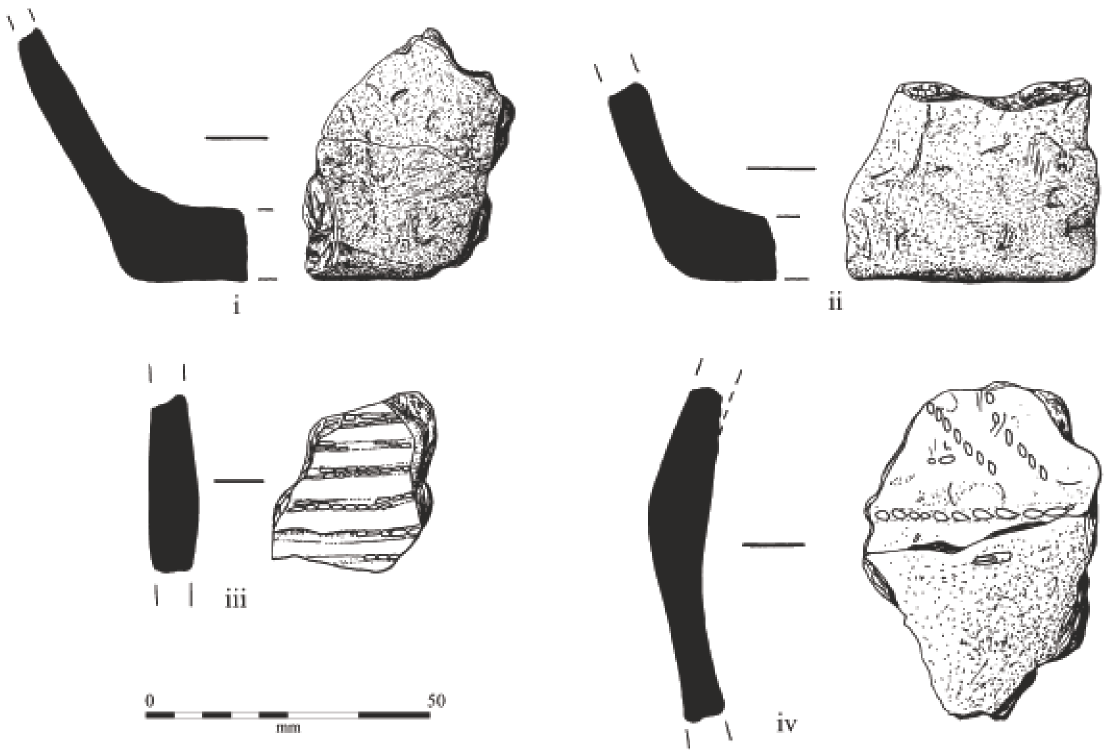


Figure 24 Diagnostic pottery from Prickwillow Road (Site 1)

land surface. That such a depth (generally up to 0.30m) of tertiary fill was present suggests that the pits were not fully infilled as if, perhaps, to draw attention to their presence in a settlement landscape. The paucity of ceramic finds may be interpreted either as deliberate exclusion from pits that contained predominantly bone arrangements and fragments, or as indicating ceramic usage at some distance from this area. It is of interest, however, that the durable flints of the ploughzone scatter gave way to an excavated assemblage consisting almost entirely of well preserved bone, showing signs of butchery and subsequent dog-gnawing. The fieldwalking flints derive in part at least from a Neolithic scatter, which was already becoming displaced and redeposited into the features of the later occupation in the Early Bronze Age. While no physical feature evidence of Neolithic activity was apparent in the field, Murphy concluded that the molluscs from F.76 were indicative of shaded conditions on the site, in contrast with plant and macrofossil evidence from the other pits, showing cleared, open country with cereal cultivation evident in the immediate vicinity (Murphy 1996). By virtue of its 0.85m depth, F.76 just survived near obliteration by the truncating cut of F.77, and its molluscan evidence suggests that it represents the only pre-clearance — possible Neolithic — pit surviving on the site.

Scattered among the large pits were numerous medium-sized pits (*c.* 0.50–1m in diameter) which continued to produce large quantities of animal bone relative to their size. Many of the bones demonstrated knife cuts and other marks indicative of dismemberment or consumption (Luff, p.37 below), which combine to suggest that the site saw carcass preparation and consumption. Only one feature occurred in 'isolation' (F.5). Given the narrow width of the easement and the distance over which archaeological remains occurred, it is likely that associated pits exist outside the investigation area.

Distinct layers of chalky backfill were seen in many pits concealing groups of specifically placed bone remains. In pit F.72, two cattle skulls — one upside-down and one positioned upright on top of it — were found beneath such backfill. A radiocarbon determination of 3360±70 BP (Beta-77752), which calibrates to 1860–1845 cal. BC and 1775–1490 cal. BC (95% probability), from one of the skulls puts this activity squarely into the earlier Bronze Age, while four other pits contained ceramic evidence — Beaker and Collared Urn traditions — which provided comparable dates for their fills.

The remaining pits on the line of the imminent pipeline trench were sample excavated. To compensate for the limited scope of excavation, artefacts were rapidly extracted from the section faces of the pits on the last day of fieldwork to augment the faunal assemblage and assist with relative dating of the fills. During finds processing, the removal of clayish silt from what looked like a large muddy rib from F.58 (a pit recorded against and beneath the western limit of excavation) proved to be a finely-worked miniature antler bow (Fig. 25). It was 455mm long and 9mm thick (tapering to 3–4mm at the limb extremities) and had been placed and backfilled in the base of the pit in association with a cow's lower mandible and smaller bones from cow and sheep/goat. Collared Urn sherds came from the base of a deep deposit of bone-rich fill (*229*) which may have derived from the slow infilling process of the 'earthwork' depression from the broadly contemporary soils of the old land surface. A radiocarbon determination from animal bone associated with the bow provided a date span consistent with that

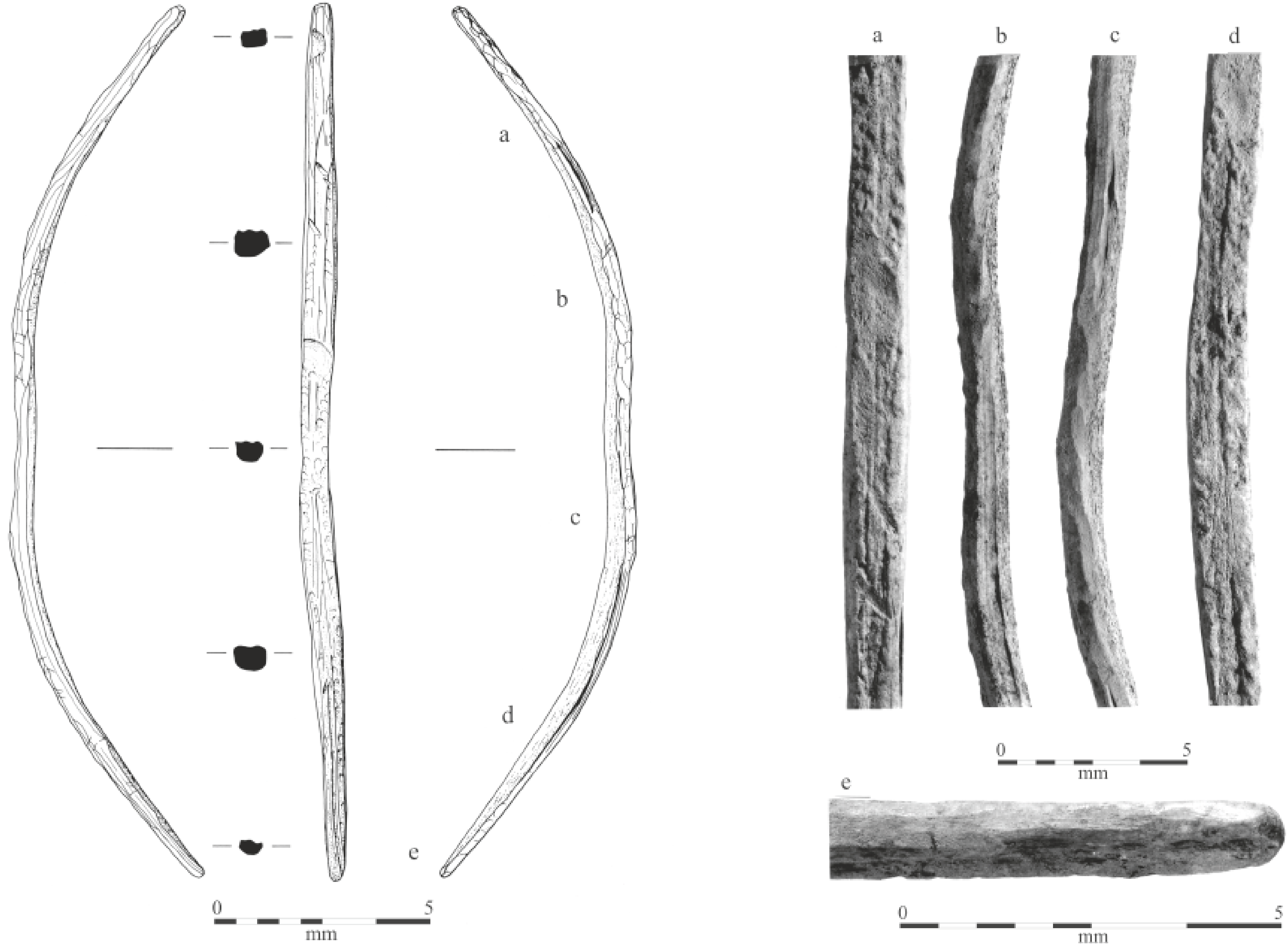


Figure 25 Miniature antler bow from Prickwillow Farm (Site 1)

Plate V The Prickwillow Road cow burial

from F.72: 3390±70 BP (Beta-77751), or 1880–1510 cal. BC at 95% probability.

Brian Boyd's analysis of the bow indicated that it was fashioned from the beam of a relatively mature red deer (*Cervus elaphus*) antler, cut from the beam by the groove and splinter technique (Clark and Thompson 1954) and then shaped along its edges using the facet of a flint burin (Boyd 1996). Overlying horizontal striations and other grooves caused during its manufacture are a number of fine, closely spaced parallel striations running diagonally along the bow edges. These have almost certainly been caused by abrasive action: by rubbing and polishing with a relatively smooth stone to achieve the desired finish. The curved shape of the limbs suggests deliberate working (involving soaking or slow heating) to achieve the resultant profile. There is no indication that the bow was strung as there are no nocks, but the polish around each tip could suggest that a cloth or leather sheath may have been secured to it, to which a bow string might have been attached.

The post-built structure

Lying on a perceptible rise in the chalk, and therefore subject to persistent truncation from ploughing, a semi-circular group of six post-holes was found 50m south of the pit cluster (F.63–68, Fig. 22). These appeared to form half of a structure/house, although any internal elements had long been destroyed. The post-holes defined a structure that was approximately 10m in diameter (or, perhaps, 8m main diameter with a north-facing porch), and were filled with a rich dark brown, slightly humic loam yielding only one find, a small flint flake (from F.65). They varied in diameter from 0.25m (F.63, F.65, F.67) to 0.40m (F.64, F.66), were of an average depth of 0.15m, and mostly had steep edges and a flat base.

Five metres east of this building, in the previously investigated evaluation trench, pit F.5 contained the plough-damaged remains of a flexed cow burial (Pl. IV). Placed in a shallow pit and, therefore, exposed to erosive ploughing, the condition of the upper part of the skeleton was poor, making difficult a positive identification of all the body parts: eighteen bone fragments incorporated in the burial suggested that the bones were either the remains of much-eroded smaller parts of the cow skeleton, or were the partial remains another smaller mammal. Further examination indicated that they derived from a single animal (Dodwell *pers. comm.*). Nevertheless, this flexed burial remained noteworthy since filleting marks on some of the bones showed that the animal had been prepared for consumption prior to burial (Luff, below).

IV. Faunal remains

by Rosemary Luff

Preservation of the animal bone assemblage from Prickwillow Road is, in general, good with several bones exhibiting well-defined cut-marks, while carnivore attack is minimal with less than 5% of the material showing dog-gnawing. Most of the identifiable fraction consists of very small, comminuted pieces of bone and teeth, and demonstrates that the skeletal elements had been well-recovered.

Methodology

Bone fragments were identified to taxa wherever possible, but this was not always feasible with some skeletal elements such as long bone shafts, ribs, vertebrae and skull fragments. These were recorded under additional categories, for example 'oxo' and 'sma' (Luff 1993), where the 'oxo' fraction constitutes large mammal remains which cannot be identified specifically to taxa (*e.g.* horse, red deer, cow), while the 'sma' fraction refers to medium-sized mammals (*e.g.* sheep/goat or roe deer).

The number of identified specimens (NISP) was used (after Grayson 1984) but for an overview on the general state of preservation among the different taxa, indicators were counted (Luff 1993). These are bones that preserve well and comprise the following skeletal parts where more than 50% is present: horn core, mandible tooth row, scapula, glenoid cavity, distal epiphyses of humerus, radius and metacarpal, pelvic acetabulum, distal epiphyses of femur, tibia, metatarsal and the proximal epiphyses of the first phalanx. Measurements follow those of von den Driesch (1976) and ageing data follows Silver (1969).

Analytical results

Table 11 shows the taxa recovered from Prickwillow Road and includes the additional categories oxo and sma. Since scarcely any deer or horse were identified in the assemblages, the oxo and sma fractions are most likely to represent cattle and sheep/goat remains respectively.

The assemblage is dominated by cattle remains and other domestic animals, including small amounts of sheep/goat, pig and horse; wild animals occur infrequently. Few indicator bones could be recorded for the assemblage; those that were are summarised in Table 12. Butchery marks on mainly mature cattle bones were present, as evidenced by the fused long bone epiphyses and extensive wear on all the cusps of the third molar of the mandible. Much of the bone had been excavated from a buried soil (*218*), but several features revealed unusual collections of animal bone.

Features F.52–58, F.61–62, F.72–74 and F.77 were examined to see whether there was anything unusual about their contents but, apart from F.58 and F.72, most contained only a few fragments of bone. Features demonstrating noteworthy assemblages are described below and are followed by a discussion of cut-marks on bone.

Taxa	*NISP*	*%NISP*
Cattle	98	47
OXO	70	34
Sheep/Goat	9	4
SMA	18	9
Pig	9	4
Horse	2	1
Dog		1
Unidentifiable	64	
Human	2	

Table 11 Total number of bone fragments from Prickwillow Road

F.5 This mostly articulated adult cow skeleton came from a flexed burial (*001*). Filleting marks on the femur, humerus and radius from the left side demonstrated that part of the animal had been consumed.

F.8 A bone-rich pit containing the partial burial of a cat (*010*, 28 bones). Several of the long bones were intact and the measurements are recorded and discussed below. The cat had been butchered as cut-marks were observed on either side of the ventral portion of the pubic symphysis, indicative of dismemberment. Extensive knife-cuts across the frontal and parietal bones of a pig skull from the same context (*010*) suggested that it had been skinned.

F.8 also contained twelve bones of cow, ten of oxo, two of sheep/goat, six of sma and two pig bones.

F.10 A partial sheep skeleton (31 bones plus 29 ribs, *011*) was recovered from this pit and was aged at less than two years by the unfused epiphyses of the tibia (Silver 1969). Knife-cuts were observed on the atlas, axis, a cervical vertebra and thoracic vertebra. In addition there were sixteen oxo fragments and the partial skeleton of a pig (thirteen bones) of less than two years (aged by the unfused epiphyses of the tibia: Silver 1969).

F.58 1.5kg recovered. This large pit contained many dog-gnawed cow and sheep/goat bones in its tertiary fill and the miniature red deer antler bow (Boyd 1996; Gdaniec 1996) in its primary fill in association with a cow's lower mandible.

F.72 Two cattle skulls were recovered from the base of this pit. Both were almost intact and the horn core suggests animals of sub-adult age. One skull gave a radiocarbon date of 1860–1845 cal. BC and 1775–1490 cal. BC (Beta-77752; 95% probability) placing their deposition in the Early–Middle Bronze Age. F.72 also yielded five cow post-cranial bones (one axis, one metacarpal and three pelvic bones), one pig cranium and two sheep/goat bones (radius and ulna). One of the cattle skulls had knife cuts on the frontal and maxillary bones possibly resulting from skinning.

The cattle bones from Prickwillow Road consist of meat-bearing and non-meat-bearing bones, the minimum number of cattle represented being five (based on the metacarpals). Most of the animals were mature.

Butchery

The bone exhibits a significant amount of information relating to carcass treatment. Since few sites of this date contain such evidence and allow for its analysis, this assemblage provides an important contribution to the study of prehistoric butchery methods.

Butchery marks can be informative of many diverse occupations within a society, speaking as they do of methods of slaughter, carcass dressing, food-processing techniques for initial consumption and/or storage, horning, skinning, tanning, tawing, glue making, grease production and bone-working. While it is not difficult to determine whether axes or cleavers have been used during butchery, detecting cuts made by finer blades — particularly stone tools — is less straightforward. The problem of recording butchery marks pivots on the fact that no standard terminology has been devised for the whole butchery process (O'Connor 1993, 63). Notwithstanding, there have been several attempts to record butchery marks, the more cumbersome being those which have attempted to describe not only the position but the direction of cutting in numerical fashion (Morales 1988). Currently the best and most informative method is to record the marks not numerically but pictorially, as was pioneered by Guilday (Guilday *et al.* 1962).

A considerable amount of published research on cut-marks has involved scanning material via the electron microscope (SEM) at very high magnifications, as pioneered by Shipman *et al.* with the use of microscopic morphology used to distinguish cultural and natural factors that produce scratch- or cut-marks on bone (Potts and Shipman 1981). Their work centred on detecting the use of stone tools, proposing that the cuts of these tools form short parallel grooves of V- or U-shaped cross-section which tend towards the former (*ibid*., 578). In addition, since almost all stone tools have retouched edges, the internal walls of the cuts can exhibit a series of overlapping lines or striae (Shipman and Rose 1983b, 67; Behrensmeyer *et al.* 1986, 769; Olsen and Shipman 1988). The identification of striae as evidence of stone tool use has been challenged, since grooves with striae have been produced by trampling bones on a sandy substrate (Behrensmeyer *et al.* 1986; Fiorillo 1989; Haynes and Stanford 1984), and carnivore tooth scratches have also demonstrated striae (Eickhoff and Herrmann 1985). In general, gnawing results in grooves of a rounded cross-section. Lyman (1994) and Haynes (1991) have shown that the criteria listed by Olsen and Shipman (1988) to distinguish trampling-generated marks from butchery marks may be invalid, as the former were not created during the process of extracting resources from a carcass. Stopp (1993), in her report on the Lower Palaeolithic bone from Hoxne in Suffolk, commented that since many of the marks examined by Shipman *et al.* are not visible to the naked eye, scanning the whole bone assemblage under the electron microscope is a questionable proposition financially. Stopp found oblique lighting, not high magnification, most useful in finding cut-marks and emphasised the lack of discussion concerning the technological capabilities of prehistoric butchers.

Using oblique natural light, fine knife-cuts — which are easily missed if viewed from above (especially those made with metal tools) — may be seen. The visibility of knife-cuts is directly proportionate to the sharpness of the tool, the pressure exerted and the skill of the butcher. The number of cut-marks may relate to and vary with the stages of carcass/joint processing prior to discard. The orientation and anatomical location of each category of cut-mark should relate to some procedure such as tendon cutting or filleting, and repeated occurrences at the same location in different bones of similar skeletal elements should also be present. This lighting method, instead of the high magnification of the SEM, was therefore used to determine tool and butchery types in the Prickwillow Road assemblage, and gave effective results.

Cut-marks

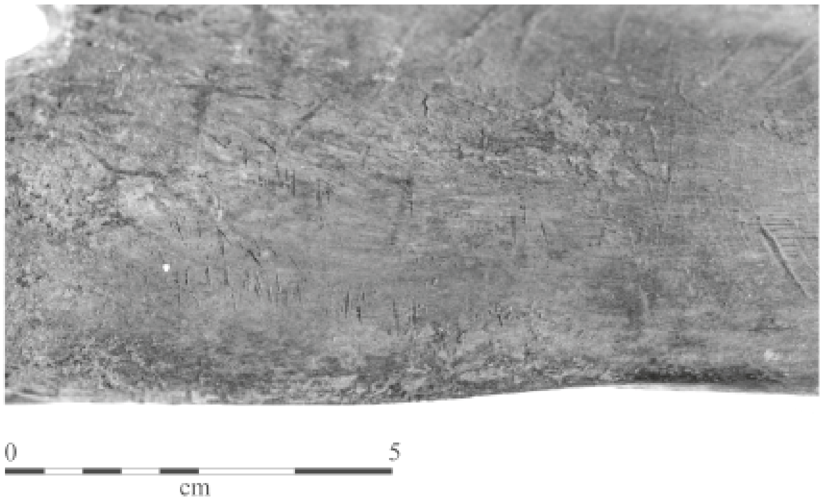
Most of the butchery marks appear to have been made by metal tools although stone tool-marks are also present. The criteria used in distinguishing metal from stone tools follows the research of Bunn (1981), Potts and Shipman (1981), Shipman and Rose (1983 a and b), Binford 1981 and Behrensmeyer *et al.* 1986):

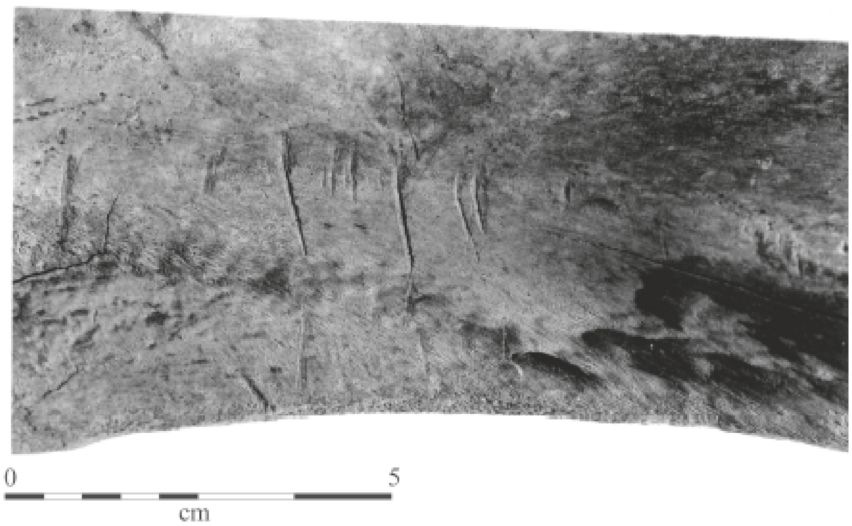
Metal tools

a) Metal tools cut into the bone from the side or obliquely, thus leaving an overlapping small 'shelf' of bone;

Taxa	*Bone type*	*GL*	*Bd*	*SD*
Cat	Femur	112	17.5	7.4
Cat	Humerus	100	17.6	6.3
Cat	Radius	99	12.3	5.3
Cat	Tibia	117	13.3	7.1
Cow	Metacarpal	197	66.6	35.5
Cow	Metacarpal	217	66.4	38
Cow	Metacarpal	249	68.8	38.3
Cow	Metacarpal	175	50.3	27.4
Cow	Metacarpal	176	50.2	26.6
Cow	Metacarpal	62.6		
Cow	Metatarsal	223	28.4	
Cow	Metatarsal	67.8		
Cow	Metatarsal	43.4		
Cow	Metatarsal	50		
Cow	Metatarsal	196	45.6	23.1
Cow	Metatarsal	199	46.8	23.2
Cow	Radius	60.7		
Cow	Tibia	49.6		
Cow	Tibia	59.9		
Cow	Tibia	300	53.7	
Cow	Tibia	54.3		
Sheep/Goat	Metacarpal	122	21.9	10.8
Sheep/Goat	Metacarpal	109	22.3	11.5
Sheep/Goat	Metatarsal	133	21.8	9.2
Sheep/Goat	Tibia		22.3	

Table 12 Metrical data for the Prickwillow Road and Snail Channel sites (after von den Driesch 1976)





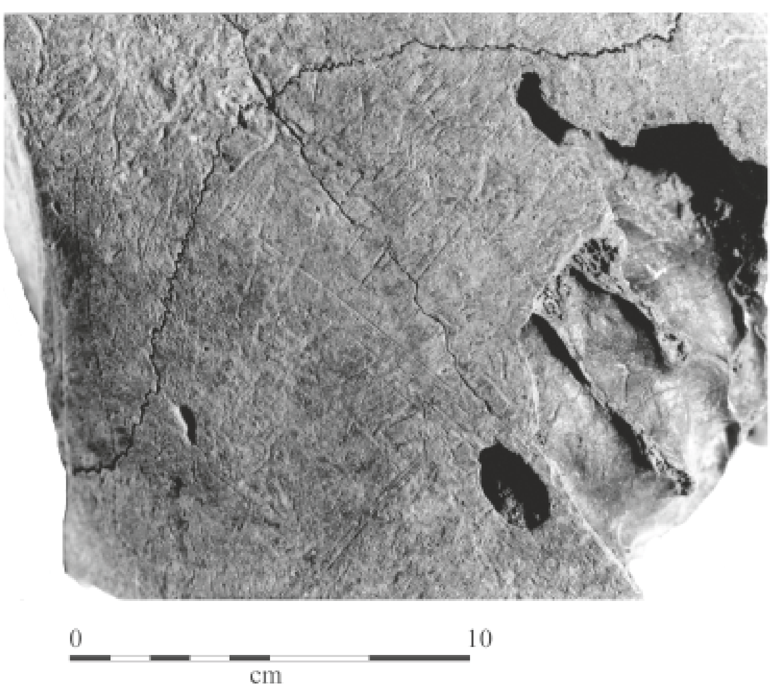


Plate VI Cut-marks on cow scapula, pig skull and cow tibia
(a and b reflect the use of metal tools; c, the use of stone)

b) the marks are often hairline in size and are extremely easy to miss if viewed from above;
c) the cut-marks are long in contrast to those from stone tools.

Stone tools

a) Involves short, sometimes parallel, strokes with a straight edge;
b) cuts demonstrate an open cross-section of 'V' or 'U' profile, with a tendency towards the former;
c) cuts have a ragged appearance when viewed from above.

Apart from that on one bone, all the knife cuts from Prickwillow Road (and from Site 6, the Snail Crossing, below) appear to have been made by metal tools. The butchery marks shown on the cow scapula in Pl. VI clearly demonstrate this. Most of the marks pertain to the consumption of flesh in that they are filleting marks, for example those on the meat-bearing bones of the ribs, scapula, humerii, radii, femora and tibiae. The Prickwillow Road assemblage contains several radii and metatarsals that had been split longitudinally in order to extract the marrow.

The left humerus, radius and femur of the cow skeleton from F.5 (*005*) are covered in filleting marks, while there are also four knife-cuts on a rib. The two mandibular buccal surfaces sport numerous knife-cuts as does the superior surface of the lateral process of a lumbar vertebra — indicative of removal of the tenderloin muscle. The partial sheep skeleton from F.8 (*011*) has knife-cuts on the ventral surface of the axis and the dorsal surface of the atlas, indicative of removing the head.

Marks on some bones showed how the animals had been dismembered. A cow skull had been chopped through the occipital condyles and so had a cervical vertebra, thus removing the head. Knife-cuts at the proximal anterior edge of a metatarsal, radius and femoral head indicate jointing. Skinning marks tended to be observed on the non-meat-bearing bones such as the metapodials. They were also identified on a pig skull (F.8, *009*) where many fine knife-cuts had been made on the frontal and parietal bones (Pl. VI). The basi-occipital area of the skull had been bashed out, presumably to remove the brains. A dog tibia had been skinned.

In contrast to these metal tool-marks, a cow tibia exhibited butchery marks quite unlike those identified on the rest of the bones. The cuts had been made by short parallel strokes, each one consisting of two indentations. The marks were crisp and clear, and occur on the medial, proximal portion of the shaft (Pl. VI). When viewed under the binocular microscope with a x40 objective, the edges at either side of the groove presented a ragged appearance and there was no sign of the overlapping edge left by a metal tool. On the basis of these observations, it is proposed that these marks were made by a stone tool.

Biometry

In metrical terms, distinguishing between wild and domestic cat on the basis of the size of the post-cranial skeleton is extremely difficult (Table 12). Notwithstanding, the animal recorded here could be domestic. The Romans were responsible for introducing the domestic cat to Britain, and thus McCormick has claimed that a Late Bronze Age cat from Ireland might well have been a product of trade with the Mediterranean area. He could not, however, rule out the possibility that it may have been intrusive from later levels (McCormick 1988). The Prickwillow Road cat is about the same size as the Irish animal, which has a humerus of 97.6mm (greatest length), but the butchery marks suggest that the animal is a part of the assemblage as a whole rather than being intrusive.

Most of the cow metacarpals range in size from 175mm to 217mm (greatest length). The smaller metacarpals of 175mm and 176mm (greatest length) fall within the size range of those from the Middle Bronze Age levels at Grimes Graves (Legge 1981), while the larger metacarpals of 197mm and 217mm (greatest length) fall within the range for Neolithic Durrington Walls (Harcourt 1971) and Windmill Hill (Grigson 1965). A very large cattle metacarpal of the wild species, *Bos primigenius* L, was found at the Snail Crossing (Site 6) and is described in the report below. The few sheep/goat measurements are small-stature examples of the species.

V. Discussion

The narrow corridor of the Anglian Water pipeline enabled a transect investigation to be made through a significant area of dry chalkland, rich in prehistoric lithic scatters, and led to the identification of an important Bronze Age site at the southern 'bottle-neck' opening of the Isleham peninsula. Fieldwork demonstrated the effects of modern ploughing on prehistoric occupation features, leaving such sites to remain mainly as lithic scatters in the ploughsoil. It also showed how that process of reworking/destruction was already ongoing in prehistory, with traces of earlier Neolithic activity erased or turned into surface scatters as early as the second millennium BC.

One definite Bronze Age structure was found although this, too, was heavily plough-truncated. Nevertheless, excavation of its associated features revealed the careful deposition of (predominantly) bone remains in backfilled pits clustered together — and sometimes intercutting — either within the broader confines of a settlement or as an external activity area. The survey and salvage excavation results suggest that many of the surrounding scatter sites may also constitute areas of settled living rather than more transient lodgings of Bronze Age communities that periodically exploited the fen-edge. This is corroborated by the environmental evidence for cereal processing and consumption.

A categoric interpretation is unnecessary, and certainly unwise considering that the site was investigated within the restricted corridor offered by a pipeline. The artefact assemblage was dominated by bone: the absence of variety within it suggests a restricted range of tasks, conducted in relative isolation (Schiffer 1987). The evidence indicates the processing of carcasses and the preparation of meat, with a particular emphasis on cattle. Much of the residue from these activities was simply left on the ground to rot, while some items (*e.g.* skulls and a complete 'worked' carcass) were selected for burial. The quantity of animal bone in the old land surface emphasises this point if it is understood that the soil was not deliberately pushed into the tops of the large pits, but gradually slumped in over time. Here, then, are the remains of animals, predominantly cow but including other major domesticates (pig and sheep/goat, found in association with, interestingly, a small amount of human bone) which were left exposed on the ground surface to be gnawed by dogs and other scavengers. This suggests, if not a wide range of activities, then at least the repeated use of a place in similar ways across several episodes.

Excavation of the relict buried soil also showed a marked contrast in the quantity of flints compared with the ploughsoil densities (eight flints came from the hand excavation of 24m^2 of the buried soil (*218)*, while ninety-one flints came from twenty-four 10m x 10m fieldwalking boxes). The pits contained reasonably high quantities of flints, mostly in their upper fills. No pottery was found in the buried soil, and only a few sherds were recovered from the pits. Two main phases of occupation are, however, postulated. The fieldwalking flint assemblage divides into a relatively small earlier Neolithic component and one spanning the later Neolithic/Early Bronze Age and equates with pits containing Beaker pottery at West Row Fen, 1.5km to the north-east across the River Lark (Martin and Murphy 1988). Beaker and Collared Urn vessels commonly occur together in site assemblages, pushing their chronological span into the middle part of the Bronze Age. Radiocarbon dates from the pit with the miniature antler bow (F.58: 1880–1510 cal. BC) and the cow skull pit (F.72: 1860–1845 cal. BC/1775–1490 cal. BC) corroborate the relative ceramic dating. With the exception of the truncated pit F.76, no Neolithic features were found to have survived the intense pit-cutting within the Bronze Age occupation area, leaving a displaced flint assemblage as the only confirmation of earlier activity here.

This field at Isleham has long been known as the location of a dispersed scatter with numerous dense concentrations (Hall 1996, 85). The flint recovered from corridor fieldwalking corroborated the presence of a large scatter, with distinctive core areas where greater quantities and different types of flint indicate ploughed-up areas of occupation and/or pits. This was particularly visible at a scatter in an adjacent field to the south-west (Hall Farm, Site 2, *c.* 900m from the Prickwillow Road site) where the investigation of a 30m-wide hollow revealed a natural pond that had been later used as a watering hole, the upper boggy fills of which contained much burnt flint in association with Bronze Age undecorated pottery and a few fragments of cattle bone. At surface level, a discrete scatter of burnt flints contrasted with the surrounding lower density scatters of unburnt lithics (Gdaniec 1994a). More generally, the Isleham scatters (Fig. 3) follow the fen edge outline of a spindly north-western peninsula and the courses of palaeochannels. Most striking, however, is the presence of large scatters located at the bottleneck between the mass of high ground (of Isleham) to the south-east and the spine of the peninsula to the north-west. The additional sites listed on the SMR enlarge the scatters in the bottleneck and suggest that a major settlement was located there, with smaller settlements or activity areas at the fen margins, perhaps exploiting the marshland resources. Most of the scatters are Neolithic with fewer Early Bronze Age examples, as defined by lithic evidence (Brown 1996) and the slight presence of Beaker pottery. This complements the findings along the pipeline, where lithic scatter evidence of Neolithic occupation masked the presence of a substantial Early–Middle Bronze Age settlement whose commanding location at the mouth of the peninsula must have been a significant focus for communities in the immediate area.

An emphasis on domestic cattle is apparent at Prickwillow Road, and the abundant evidence of knife-cuts and butchery marks indicates their preparation for consumption (as well as, perhaps, hide and sinew recovery). Parallels can be found relatively locally. A Middle Bronze Age site at Phillips Farm, Wilde Street, Mildenhall (*c.* 8km east of Isleham) produced a bone-rich assemblage dominated by cattle (74.3% of the faunal assemblage: Kelly 1967). The assemblage was found in association with a bronze knife, pottery sherds and six bone awls/needles, a bone pin and a possible blank for a bone handle (thought to be a replacement one for the bronze knife): all were preserved in a thick occupation deposit on the edge of (and most likely eroded into) an old lake, which by that time already contained sands, silts and peat growth infilling its lower half. The contextual similarities between Phillips Farm, the former pond at Hall Farm (Site 2, p.21, above) and Prickwillow Road are striking. They demonstrate the use of these water sources in the Bronze Age, and emphasise the importance of cattle husbandry for the local community in this hummocky terrain around the 5m OD contour. The lack of 'general domestic refuse' at both Prickwillow Road and Phillips Farm — represented by pottery, variety in the macrobotanical evidence, spindle whorls and other small finds — also intimates that these may have been task-specific areas, located at a distance from places of more persistent settlement. If, as is suggested by the recovered faunal remains, those tasks involved the preparation of animal carcasses, then the location of the site was significant in terms of its proximity both to the fen-edge resources and to cultivated areas that may have surrounded the site. Visible only as a palaeoenvironmental signature, cultivation in the general area was probably not associated with the ditched field systems that are so distinctive of the west and northern fen-edges (*e.g.* at Fengate, Peterborough: Pryor 1980 and 1996; Barleycroft Farm, Bluntisham: Evans and Knight 1997) since none have yet been found on the south-eastern fen-edge (Healy 1984, 118). More likely here was a pattern of informal plots, bounded perhaps by scrub at clearance limits, elsewhere by hedges or even low banks.

Perhaps the most striking aspect of the Phillips Farm site is the dominance of scrapers in the lithic assemblage (eighty-eight from the 10m diameter investigation area). Together with the bone awls and the metal knife, the assemblage suggests that carcass preparation — for meat, hides, sinews and so on — took place here. Although a contrast is evident in the Prickwillow Road lithic figures (only nine Bronze Age scrapers and twenty-six retouched flakes were found), the cut-marks on the animal bone provide unequivocal evidence of skinning, filleting and other butchery practices. Luff's cut-mark analysis argues that much of the cutting had been done using a metal implement and the discovery of the Phillips Farm bronze knife provides an acceptable example of one. While metal items are anticipated in earlier Bronze Age assemblages, direct evidence for their use as processing tools is relatively unusual, cut-marks from flint tools being rather more common.

The miniature bow has been described in detail elsewhere and some of its implications briefly discussed (Gdaniec 1996). Many explanations for the presence and purpose of the bow were suggested at the time of its discovery. Chief among these were that it served as a child's toy or a bow-drill — both of which imply that the bow functioned as a working object. This seems unlikely, however. While lengths of antler were used in the manufacture of composite bows (MacGregor 1985; Cotterell and Kamminga 1990) it is not resilient enough to be the sole fabric subject to the stresses and strains of a drawn bow used for any practical purpose. Using both replicas and original specimens, the mechanics of drawing and releasing a bow have been well-researched (Bergman *et al.* 1988; Kooi and Bergman 1997), the results of which rule out a practical use for the Isleham bow. Nonetheless, the bow had certainly been well handled. It displays considerable wear gloss at both tips (probably from a collar that may have carried a bow string), and the spongy tissue on the internal surface is almost completely smooth. The ragged outer tissue, characteristic of antler, has also been worn down (Boyd 1996). Whatever the context and character of its handling, the shape of the bow is particularly interesting. The marked curve in profile denotes that it is already drawn, a bow in the *process* of being used.

Other suggested interpretations for the bow dwelt less upon utility and more on what it may have symbolised. A common response was that it was probably an element in some form of ritual paraphernalia, handled in the context of rites which have left no local archaeological signature. In other words, the bow held a symbolic significance through its connection to activities such as hunting and fighting that, on occasion, required observances and offerings if they were to prove successful.

This interpretation certainly has its attractions, and gains a measure of support from other contexts, not least the evidence of Final Neolithic and Early Bronze Age burials. These are historically and geographically varied, but in many areas it is not uncommon to find arrowheads, quivers and related archery gear with individual (often male and Beaker-associated) burials. A few arrowheads have even been recovered from within bodies themselves, representing old wounds carried through life or, more often, the cause of death. Often, the deposited items are small in number and show signs of prior use, perhaps being the gear of the deceased or gifts given to the dead by the mourners (Edmonds 1995). In some cases, however, artefacts appear to have been expressly made for display and/or deposition with the body, their pristine condition indicating that they were never used. This finds spectacular expression in the funerary deposits from Breach Farm, Glamorgan (Grimes 1938), which included a handful of elaborate and unused barbed-and-tanged arrowheads (a quiver?) along with further unfinished arrowhead blanks and other items. Wristguards associated with archery are also present in a number of graves, ranging from simple stone plates to the elaborately perforated gold-capped stone example from the Beaker burial at Barnack, Cambridgeshire (Donaldson 1977; Kinnes 1985).

The remarkable variety of artefacts (and, by extension, tasks) associated with Early Bronze Age burials stretches far beyond archery, and thus beyond the scope of this discussion. Here, it is sufficient to suggest that the event of burial at that time may sometimes have involved different aspects of a person's identity being brought into focus by the mourners. Selected from belongings or given as gifts, the placing of artefacts around the body made connections between living and dead, at the same time drawing attention to important roles and practices. Present evidence suggests that archery was one such practice. Employed in hunting or in fighting — both inherently social fields in which renown or standing might be gained — a bow required skill in its making and in its use. These skills would have been of great importance at the time, when game was still abundant and when feuding, rustling and other graded forms of fighting were probably endemic. Being able to handle a bow, talking knowledgeably about it; even using it as a cue in the recounting of stories — these are all likely to have been common frames of reference for those participating in hunting parties or in occasional bouts of fighting. Indeed, it is probable that these activities brought people into 'communities of affiliation' that cut across the more immediate lines of kinship and descent.

It is against this background that the miniature bow from Isleham needs to be considered. Lacking any clear context, it remains enigmatic: a subject for connoisseurship rather than for substantive interpretation. While archery was probably a socially significant practice at the time, all that this tells us is that the bow may well have been regarded as a potent item — and this does not take us very far. The very reasons that suggest a possible role in some form of observance would have made it an equally appropriate toy or model for children to handle.

Looking at the project as a whole, the issue of context is paramount but difficult to develop within the constraints of such a linear programme of fieldwork. On the basis of evidence from within the corridor, the Prickwillow Road evidence could be interpreted in several ways. However, when set against the landscape of (broadly) contemporary scatters, it probably represents a resource-rich marsh and river margin at the mouth of the peninsula, lying close to nearby settlement areas. Here specific tasks were periodically carried out, adding to the residues of earlier episodes scattered around the fen edge. Whether occupation of this area represents part of a seasonal round or was persistent by this time is difficult to say. The presence of cultivation signals suggests some duration, as do the truncated remains of the small timber structure. That said, in a period measured in centuries, and across which neither land nor water 'stood still', we should acknowledge that we may be missing changes which resolved themselves over the scale of a lifetime or of a generation.

5. Site 6: The River Snail, Fordham Moor

I. Introduction

Relict channels of the Mesolithic–Bronze Age palaeochannel system of the River Snail lie adjacent to the present sinuous line of the Crooked Ditch, a drain which marks the parish boundary of Isleham and Fordham. These ancient and modern drains coalesce to define the edge of the chalk dry land at Fordham Moor (TL 6225 7353), south-west of the Isleham peninsula. The conjectured course of the Snail palaeo-river system was mapped by Rog Palmer for the Fenland Survey (Hall 1996), and while parts of its course are difficult to trace, it survives as earthworks in several locations. A junction of at least three channels is evident in low relief in a pasture field (previously ploughed) at Moor Farm, Fordham Moor, which was crossed by the Anglian Water Ely–Isleham water pipeline. Together with the neighbouring River Lark to the north-east, the two river systems formed intensively occupied valleys in the south-east fen — this occupation is evident today in the innumerable prehistoric scatter sites which fringe the fen margins and disperse inland. Scatters on the undulating chalk and (fenward) sand landscape of the area lie close to the later Neolithic/ Early Bronze Age site of West Row (Martin and Murphy 1988) and within several kilometres of Hurst Fen (Clark *et al.* 1960).

The level of agricultural erosion of the riverside sites was evident in the pipeline evaluation trenches, which revealed plough-scarred natural subsoil in which few shallow features survived (see above; Gdaniec 1993). High lithic densities were contained in the thin ploughsoil (less than 0.25m thick in places) which became the main focus of investigation prior to stripping. Of greater significance were the well-preserved waterlogged palaeochannel deposits that contained Early Neolithic–Bronze Age lithics, pottery sherds, animal and human remains. Although palaeochannels are frequently encountered in the fens and on the gravel terraces bordering the wet region, they are seldom directly connected with human activity. Consequently, the Snail palaeochannel sediments provided an invaluable environmental sequence for the local area that could be related directly to archaeological deposits.

Site 6 encompassed the well-preserved palaeochannel deposits of the River Snail at the pipeline crossing of the Crooked Ditch (the present canalised drain and, most likely, the youngest course of the ancient river system), and a surrounding zone of *c.* 70m each side of it. Recent ceramics and general farmland rubbish were evident on the field surface. For two reasons, however, very little prehistoric material was recorded. Firstly, the main braid of the palaeochannel available for investigation on the east side of the Crooked Ditch contained Bronze Age and later peat deposits that sealed its edges and lapped over the broad, shallow eastern river edge, sealing flint-bearing earlier soils that had not been eroded by ancient river action or the plough. Secondly, a pasture field lay on the west side of the Crooked Ditch and was therefore unavailable for fieldwalking. The low earthworks present in this field have been plough-modified in the past but, despite this, they retain an aspect of the braided channel system at this part of the peninsula's edge. The ploughed fields adjacent to the pipeline route show the dark peaty soils infilling the palaeochannel's narrow valley; these thin out to display the grey-white chalky marl and chalk substrata of the Isleham peninsula (east) and reddish sandy soils across this part of Fordham Moor (west). The stripped easement of Site 6 revealed one of the palaeochannels with associated shallow features on the east bank and deeper pits on the west bank, which are described and discussed below. The proliferation of lithics in the ploughzone around the evaluated area of the channel demonstrated that the sites that generated them had been truncated to the extent that none but the deepest features were expected to have survived.

Since so much material survived only in the ploughsoil, fieldwalking and test-pitting were paramount. Using the same fieldwork methodology as that employed on selected sites of the Fenland Management Project (Boast and Evans 1991; Hall and Coles 1994), grid-based test pits were excavated to reveal both section information and physical feature evidence, with an emphasis on the examination of buried soil horizons (where present) for artefacts and environmental data.

II. Fieldwalking

(Fig. 26)

The route evaluation artefact survey confirmed the presence of known scatter sites on the peninsula slopes (*e.g.* Hall's Sites 2 and 3: Hall 1996) and indicated their continuation and the presence of others across the valley (Gdaniec 1993). During the excavation, an attempt was made to chart lithic densities in a transect roughly 1km long across the main scatter areas (including Sites 4, 5 and 6), or where the crop schedule allowed (see Chapter 2). All other artefacts from the survey related to relatively recent manuring episodes (medieval to present) or to the ploughed remains of a small medieval site, and are not further discussed here.

The fieldwalking transect traversed three sites (Sites 4, 5 and 6: Gdaniec 1994a): two of these constituted known sites, while the third was a new discovery during the route evaluation (Figs 3 and 4). Unexpectedly high quantities of both flint categories were recovered from fieldwalking in the unweathered corridor (6.5kg of burnt flint and *c.* 400 worked flints). Across the known scatter at the east end of the transect (Hall's Isl 3, Pipeline Site 4) the four to fifteen worked flints recovered per 10m unit confirmed the passage of the pipeline through the site. Equivalent densities were retrieved from intensive scatter testing of Neolithic and Bronze Age sites in a similar setting at Eye Hill Farm, Soham to the north-west, where 'site core' levels ranged between ten and thirty-five pieces, with internal occasional high values of fifty to seventy pieces (Evans and Gdaniec 1992; Edmonds *et al.* 1999, 56).

Despite problems of visibility noted above, the surface of Site 6 did display some patterning. The erratic peaks and troughs of the burnt flint distribution

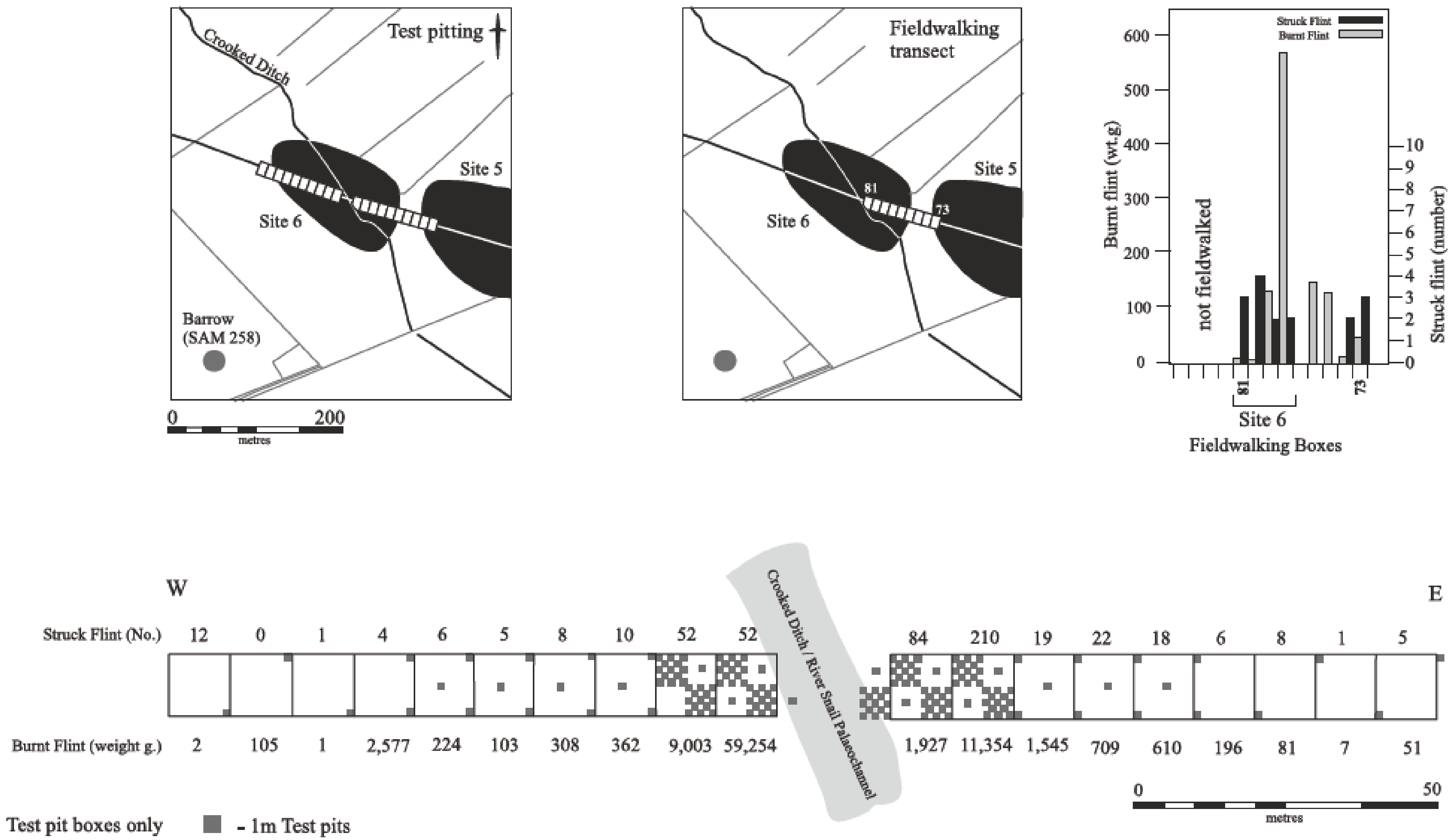


Figure 26 Test pit and fieldwalking densities on the west and east banks of the Snail palaeochannel (Sites 5 and 6)

were highly conspicuous in the field and represent the ploughed remains of pits and/or surface dumps (burnt flint mounds). The density of burnt flints increased as the transect descended the chalk slope towards (and within) the braids of the Snail palaeochannels (see test pit results, below). A pasture on the west side of the Crooked Ditch was unavailable for fieldwalking but gradually decreasing densities of burnt flint were evident as the pipeline traversed the fields further west.

Lithic analysis suggests significant Early Neolithic activity, probably representing the main period of occupation of the valley. Earlier activity is only hinted at in the occurrence of one or two Mesolithic points, while later Neolithic and Early Bronze Age activity is most visible in the distribution of burnt flints in association with a contemporary flint assemblage — a finding consistent with Brown's appraisal of the Fenland Survey Isleham lithics (Brown 1996). Of course, not all of the burnt flint may have been generated from second millennium activities: some may well represent tasks connected with earlier Neolithic, or even early Roman occupation of the valley, a point stressed by Silvester (1991, 86). However, the association with Late Neolithic–Early Bronze Age ceramic evidence in this locality suggests that the burnt flints derive from broadly contemporary activities (p.50, below). Such a simplified view of the nature of the Isleham–Fordham Moor lithic assemblages somewhat distorts their character, which is dominated by overlapping assemblages of mixed chronologies and function. While it was recognised that the nature and extent of use of this part of the fen-edge could not be definitively outlined in a linear study, subsequent excavation in the easement clarified some aspects of the lithic distributions, demonstrating the level of buried soil and feature truncation caused by both ploughing and river-edge erosion (except on the lowest slopes, where riverine and peat deposits ensured their preservation).

III. Test pit survey

(Pls VII–X; Figs 26–9)

To complement the fieldwalking results, an intensive ploughzone test pit survey was conducted ahead of the easement strip (TP = test pit in the text below). Centred on the dividing boundary of the Crooked Ditch/Snail palaeochannel, the test pits occupied 200m of the 10m-wide fieldwalking corridor. Test pits 1–85 covered the eastern slope of the dry chalk land (between 3.80m and 2.40m OD), and test pits 86–160 covered the lower-lying western floodplain area (2.75m–2.30m OD). The pattern of test pits was designed to examine the bankside activity in the following way (Pls VII and VIII; Fig. 26):

a) In a 20–25m wide zone each side of the channel, alternate 1m x 1m test pits were excavated in opposing 5m x 5m boxes (thirteen per 5m box). A single test pit was then excavated in the remaining two unexcavated 5m squares — the whole infilling the 10m x 10m fieldwalking unit (twenty-eight TPs per 10m box). A half box (10m x 5m) was inserted into the remaining space over the channel on the east bank (seventy TPs on the east side of channel and fifty-seven on west side).
b) For 30m beyond a), test pits were excavated in the corner of each 10m square unit and a single test pit excavated in the centre (fourteen TPs on the east side, eleven on the west).
c) For 40m beyond b), staggered test pits were dug in alternate corners of the 10m unit (four on the east, three on the west).

The 160 test pits were excavated using a mini-digger, separating the 0.25–0.50m thickness of ploughsoil (*201*) from any underlying soils of the B horizon (*202*, *303* and *304*); in most cases only a mixed ploughsoil remained. The ploughsoil consisted of chalk-rich and humic loams, which survived to its greatest depth in the centre of the relict channel where it was distinctly peaty. Contexts *303* and *304* were organic/humic loams and *202* a remnant brown earth, quite distinct where trapped in the undulating natural chalk sub-strata. A 30-litre sample (two buckets) was initially hand-sorted through a 5mm mesh. This was to recover the fine material and determine the quantity likely to be missed in the hand-sort, and to assess the relative quantity expected in the whole heap. Since the two banksides produced contrasting unburnt to burnt flint densities (and thus higher quantities of small shattered fragments on the west side), the 30-litre sample served as a control on the type and nature of recovered flint. The distribution maps and density values illustrated here, however, comprise amalgamated values of each retrieval type and soil contexts, since B horizon soils were scantily preserved.

As noted above, the line of the evaluation across Isleham created a rather curious 'window' on deposits and distributions. The route traversed the edge of the dry chalk 'upland' and valley at an oblique angle — coincidentally, almost parallel to the conjectured course of one of the main palaeochannels. This meant that the majority of assemblages offered insights on activity by the river and at the fen edge: they did not provide a basis for inferring relations with spreads situated further upslope. To overcome this problem assistance was sought from English Heritage, who funded more fieldwalking and the excavation of an additional sixty 1m x 1m test pits on either side of the Snail channel system, covering an area of approximately 12.5 hectares.

The enhancement survey was conducted after the reinstatement of the pipeline corridor. Within this, the fieldwalking programme sampled the surrounding area by surface collection from 10m collection boxes arranged on a 40m interval around a core area of 400m x 200m. Further boxes were walked around the grid-based boxes where relatively high densities of artefacts were found — forming, at times, mini-transect lines. The test pit locations matched the core grid of the fieldwalking units, although the fieldwalking itself extended over a greater area.

A medieval and post-medieval pottery scatter extended downslope to the palaeochannel and was incorporated into all visible soil horizons. Sherds of abraded Neolithic and Early Bronze Age pottery were also found. Table 13 illustrates the artefact quantities recovered by all investigation methods and the distribution maps Figs 26–8 highlight the contrasts between the two main material categories recovered from each side of the investigated channel.

The principal artefact categories were burnt flint, worked flint, pottery and bone. With a total of 168.4kg, burnt flint is dominant, with 88.4kg (52.5%) recovered

Plate VII Test pit grid to the west of Crooked Ditch

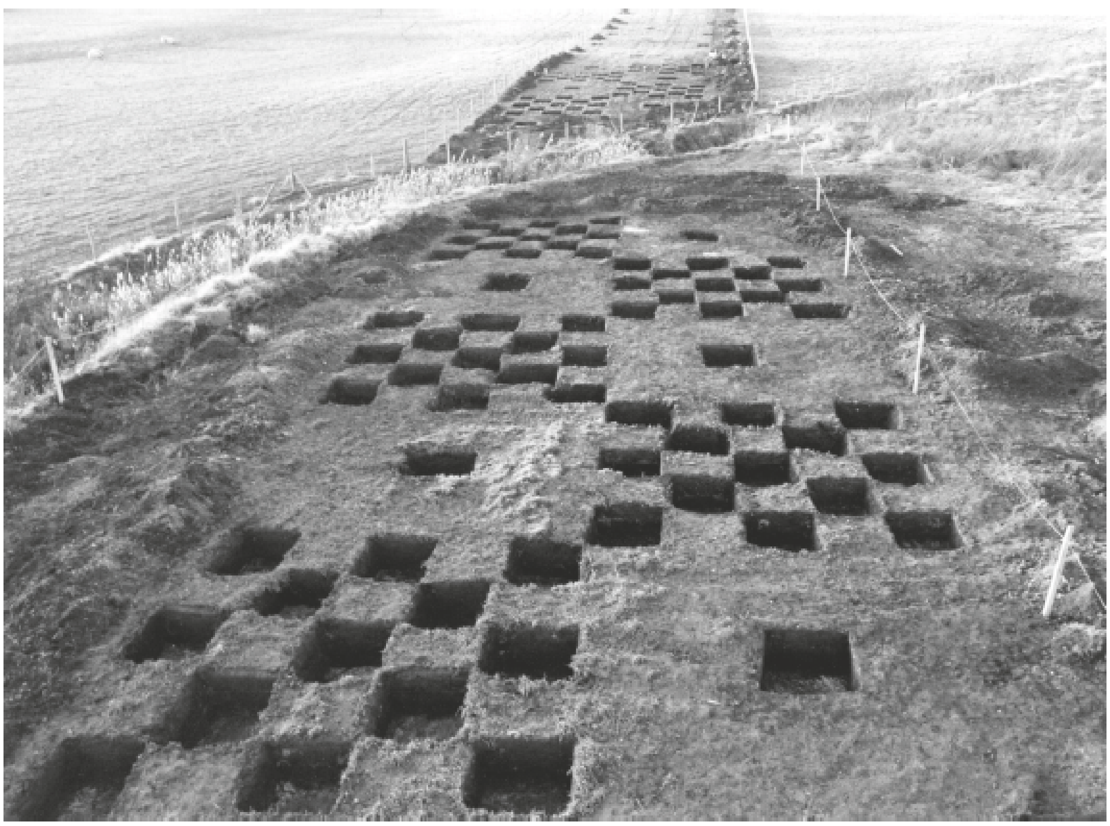


Plate VIII Test pit grid to the east of Crooked Ditch

Category	*Fieldwalking*	*Test pits*	*Excavated finds*	*Total*
Burnt flint	1.04kg	88.4kg	79kg	168.4kg
Flint	16	524	131	671
Pottery		174	35+ crumbs	209 +
Bone	5g	5.6kg	2.2kg	7.85kg
Worked stone		1		1
Burnt stone		1		1

Table 13 Artefact quantities from the three investigation methods conducted in the pipeline corridor at the Snail Channel

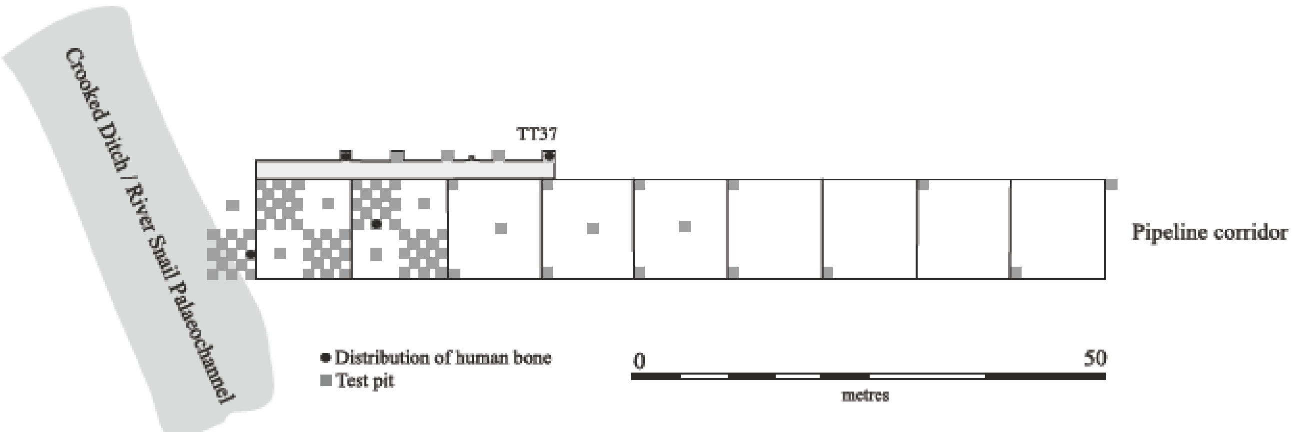


Figure 27 Distribution of human bone in the test pit surveys

Plate IX Pits adjacent to the Snail palaeochannel

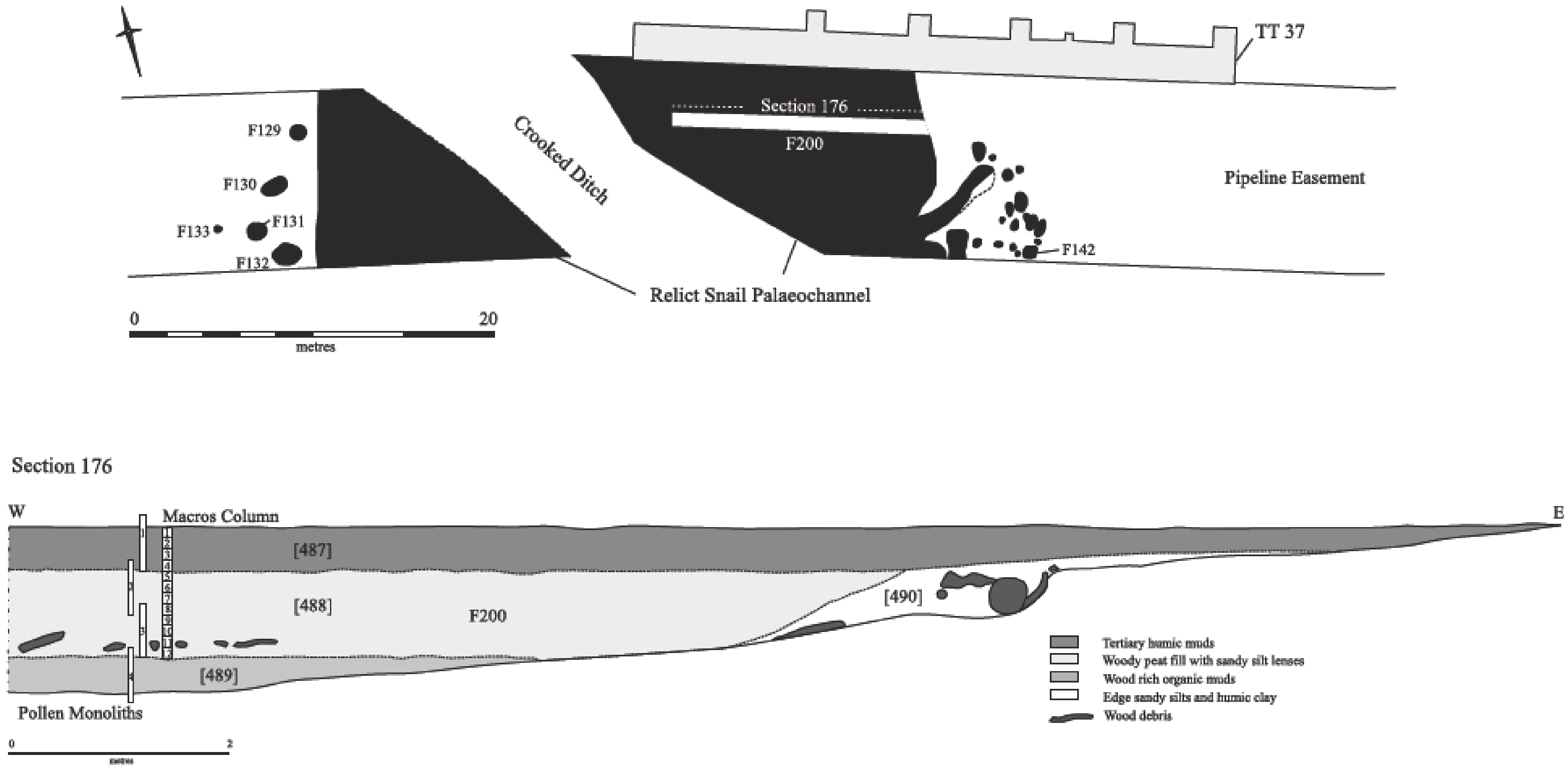


Figure 28 Plan and section through the eastern half of the Snail palaeochannel, showing position of pollen monoliths and plant macro sample column

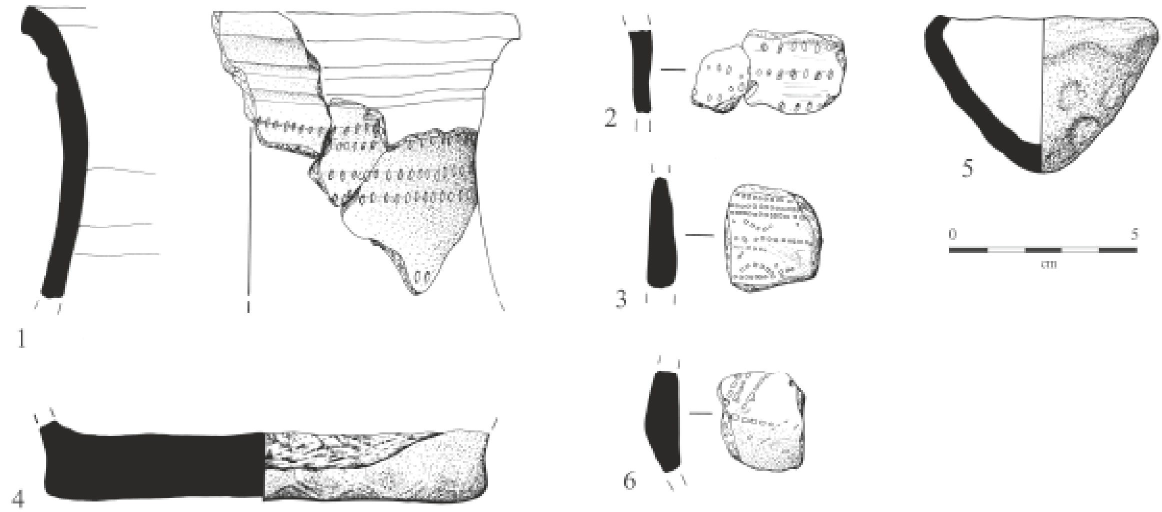


Figure 29 Diagnostic pottery from the Snail palaeochannel

from test-pitting: 16.4kg from the east side of the channel and 72kg from the west side. By contrast, the field-walking survey yielded only *c*. 1kg of burnt flint at the Snail channel site. Similar contrasts are also evident in the unburnt flint results: only sixteen (4.1%) of its flints were recovered from fieldwalking, compared to 373 from test-pitting on the east bank. The test pits and subsequent feature excavation demonstrated that low surface densities prevailed over the channel deposits due to the greater depth of B and ploughsoil horizons infilling the relict channel, effectively locking in their artefact populations. The quantity of both flint and burnt flint increased as the ploughsoil became (much) shallower higher up the banks, demonstrating both downslope continuation of the known prehistoric scatter located further north-east (Hall's Site 3), and the better survival of sites located below the current plough depth.

The flint quantities from test-pitting range from 151 from the west bank and 373 from the east bank — or 28.8% and 71.2% of the total of 524 flints. These densities directly oppose those of the burnt flint assemblage (total 88.4kg), where the largest group, 81.4%, came from the west bank, while only 18.6% came from the east bank. While the banks of the palaeochannel supported activities involving burnt stone, or the heating of stone, it is clear that these activities were mostly concentrated on a small spur (mini-'island') of land between two channels of the river system. Some 60–70% of the burnt flint had been worked prior to heating, which further indicates a scale of activity unexpected from the unburnt struck flint assemblage alone. This huge proportion reflects the importance of the water source here (and, perhaps, relative easy access to it) at least as a focus for processing activity if not for settlement in general.

While 174 pottery sherds were recovered from the test pits, these were principally of medieval date and related to a ploughed site upslope to the east (Site 5). However, twenty Neolithic and Early Bronze Age sherds in varying conditions and two 'groups' of Beaker sherds (with compression breaks) from individual vessels on either side of the palaeochannel came mostly from the lower soil (B horizon) and buried soil (*202* and *304*). The group of Beaker sherds from the west side of the channel (Fig. 26, TP86; sherds illustrated in Fig. 29) are a distinctive element in the assemblage on two counts: they were decorated using the Barbed Wire motif and were tempered with small rounded stones not typical of local tempers. This rather coarse temper was skilfully hidden by the potter by attentive smoothing and wiping of both surfaces of the vessel, enabling a styling precision for the ornamentation. Barbed Wire Beakers are considered to be a distinctive East Anglian style — they are common in domestic assemblages (Lawson 1984, 146) — and it may be that the remaining undiagnostic sherds from adjacent test pits mostly represent a domestic Beaker assemblage. The presence of the diagnostic Beaker sherds in the test pit assemblages that also contained barbed-and-tanged and chisel arrowheads, a plano-convex knife and thumbnail scrapers, provided a neat group of occupation evidence that was later found to be contemporary (through pottery association) with the visible pit-related activities that required great quantities of burnt flint (see below). In addition to the Beaker sherds, a large portion of a flint-gritted flat base of evidently Bronze Age fabric, perhaps part of a possible Bucket Urn or Deverel Rimbury-type vessel, was found in the silts of the upper edge of the palaeochannel. Its fabric contained chalk grits, grog and vegetable tempers and showed signs of wiping to create a passable surface on the coarse fabric. The vessel had not been fired and was still plastic when first discovered. A further six assorted undecorated Bronze Age sherds came from the ploughzone (*201*).

The presence of animal and human bone in the patchily-surviving buried soil horizon precludes anything but generalised comments on the nature and character/function of occupation activities. Luff (p.77, below) found that five cow/'oxo' (unidentifiable large mammal) and two sheep/goat bones, again mostly deriving from the B horizon and buried soil, bore signs of knife cuts or filleting marks principally occurring on tibias but also on individual bones of humerus, femur and scapula, while cervical vertebrae of a cow bore chop/dismemberment marks. Although the marks were found to be consistent with stratified Bronze Age examples elsewhere at the

Plate X Refitting fragments of worked red deer antler

Snail Crossing and at the Prickwillow Road site, we cannot be certain that these bones from the test pits are all prehistoric and that some do not derive from the medieval occupation of this part of the Snail valley.

Six (mostly refitting) pieces of red deer antler with deep incision marks were recovered from TP50 (*202*). Dr Brian Boyd kindly provided the following technological description:

The two smallest pieces have one rather ephemeral incision; one large piece has two incisions which just cut into the surface; another large piece, taken from a tine rather than the beam, displays five very shallow cut marks, including one on the surface (Pl. X). The most interesting pieces are two beam fragments displaying a number of deep incisions:

1. a small fragment with three incisions which cut halfway through the wall;
2. a large fragment with four deep incisions on the edge, one on the surface, and a number of 'false start' scratches.

These two pieces are of interest in technological terms since the incisions have been made not using a stone blade but with a metal implement, as evidenced by the very precise, 'clean', V-shaped profiles. There is no evidence of the sawing motion required when using a stone blade. The implement was probably a metal knife, and was used to cut small pointed slips from the antler beam. The relatively few cut-marks on the inner surfaces of the incisions themselves indicate that the antler was almost certainly soaked to facilitate easier cutting. It is unclear whether the aim was to deliberately produce small points or to produce incisions on the antler surface for some purpose — such as for use as a tally stick or tie shaft.

Fourteen human bones were recovered from bucket sampling and test pits from both the evaluation and excavation phases of pipeline fieldwork. All were analysed by Natasha Dodwell and her full report is held in the site archive. Principally recovered from the surviving patches of buried soil, their fragmentary nature attests to their general presence in an old land surface and a lack of formal burial (Fig. 27). Some bones were found in the upper peaty muds of the infilling palaeochannel (a right adult femur in good condition was found whilst machining the first channel sondage). The distribution, and the age and sex (where they could be established), of these bones suggests the presence of at least two individuals. Their presence within the accumulating fen deposits is not unknown in a Bronze Age context (Healy and Housley 1992; Brück 1995) and may be representative of disturbed fen/river burials or rituals associated with corpse preparation at a water source prior to or instead of burial.

IV. Enhancement survey

Fieldwalking commenced in the south-west corner (Box 1) of the arable fields on the north side of the Crooked Ditch and, at first, was continued along the 40m northing to Box 48 in the north-east corner of the designed survey area near the road corner (Figs 30 and 31). Appended boxes clustered principally around a distinct area dense in lithic activity in the north-centre of the survey area, and expanded other points around the northern margin of the palaeochannel junction. Nine boxes, on a 40m interval, were added to the eastern part of the survey area, broadly linking it to the pipeline fieldwalking transect, but artefacts were recovered from 116 10m-square boxes in total. In terms of enhancement information, the survey demonstrated that the extent of occupation continued beyond the survey area boundaries. However, fine detail from and between activity centres will not have been collected using the coarse survey grid adopted, which aimed only to expand the impression of activity around this confluence by sampling the surrounding scatters on the dry slopes east of the Snail and the low terrace to the west.

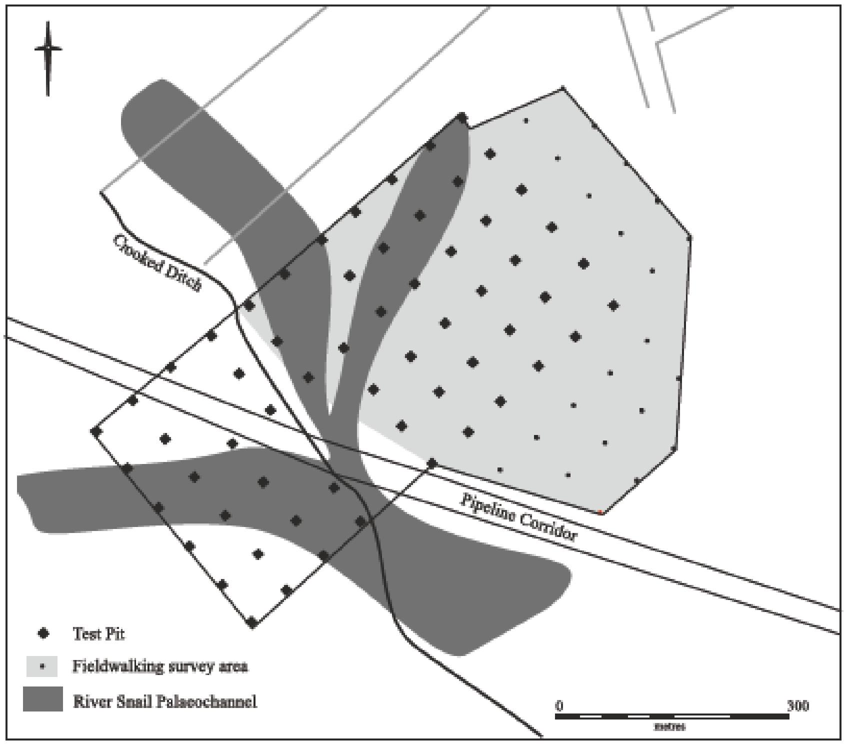


Figure 30 Test pit and fieldwalking areas of the enhancement survey (note that the pipeline traverses the Y junction of the three palaeochannels: the lower twenty-four pits were located in the pasture field)

On the slightly higher north slope of the palaeochannel an occupation area was clearly visible in the fieldwalking densities. Here, an average of roughly thirteen flints per 10m x 10m collection unit covered an area of *c.* 800m² (Fig. 31). Peaks of forty-two flints in a single collection unit probably indicated the ploughed-out remains of a pit or a knapping event on the old land surface. The burnt flint distribution was visible both by high peaks of *c.* 1.2kg in a single fieldwalking box and by a generally low background presence of around 80g per box. Two distinct peaks occurred in the burnt flint distributions, both times in depressions in the undulating surface of the shallow valley slopes. These may be indicative of cooking or processing areas or of some other process requiring the heating of water at the river's edge.

Sixty test pits were spoil-sorted: thirty-six in the arable fields on the east bank (1–36, numbered from south-west to north-east) and twenty-four in the pasture field of the west bank (37–60 from west to east). The test pits yielded lower lithic densities compared to those from surface scatters, indicating the level of plough attrition to the former land surfaces and shallow features. However, even casual observation of both the peaks and troughs of the worked and burnt flint distributions and the field map of the palaeochannel system shows how intensively this small area of river margin was used (Fig. 31). Burnt flints show sporadic low peaks of around 100–125g at the edges of the larger side channels and main channel system on the east bank but show markedly higher densities on the west bank: these findings are consistent with the results from the pipeline. This area showed that while some test pits lacked any prehistoric finds, one quarter of them yielded burnt flint densities of 100–600g. Since the main river channel obliquely traversed the pasture field, many of the test pits exposed artefact-free peat fills of the main and smaller side channels. The activity areas on the banks of the main palaeochannel system were clearly visible, however. It is unlikely that all the channels visible as earthworks today were active at the same time. Some probably pre-dated others by considerable time periods (the late-glacial flora present in the basal deposits of the main channel deposits provides a useful *terminus post quem* for the investigated main channel: Wiltshire, p.62 below). However, the majority of burnt flint came from test pits located on the west bank of the large oblique channel — effectively between the old river to the north-east and a scheduled round barrow (SAM 258; which still produces small sherds of Collared Urn-type pottery from its many molehills) to the south-west. Although the very base of a pit was the only cut feature visible here (and yielded little information) it is probable that pits containing large quantities of burnt flint also occur in the vicinity, as was seen during the pipeline investigations further north in the pasture field.

Since burnt flint fragments were found in all parts of the field — except where the stream channel deposits masked their presence — it is the worked flint distributions that are, perhaps, more instructive and define the activity on the west bank in the significant location between the old river and the round barrow. The west bank yielded high quantities in those same areas rich in burnt flint. Five 1m x 1m test pits produced between twelve and thirty-two flints in depths of *c.* 0.30m of former ploughsoil (now pasture turf) and *c.* 50–100mm of relict buried soil (where present) and are equal to those densities recovered when fieldwalking in 10m x 10m units on the east bank. Although keenly sought, no evidence was found of any hearths, clamps, or other type of fire device that might represent the source of the huge burnt flint presence here.

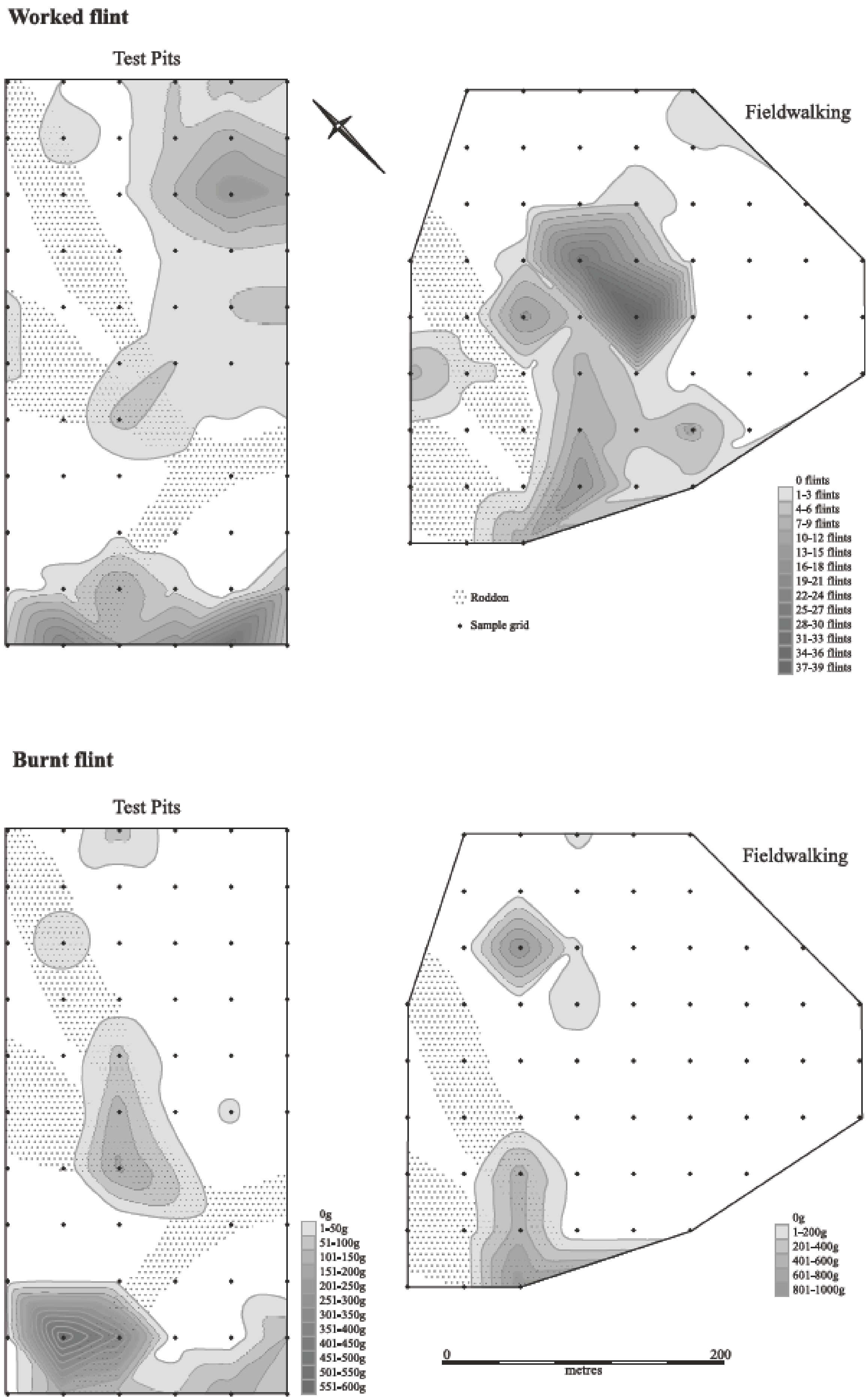


Figure 31 Flint and burnt flint densities in the enhancement survey: fieldwalking and test pits

Neolithic and Early Bronze Age undecorated pottery sherds were also recovered from the test pits (*c.* fifty sherds and crumbs) in similar densities on each side of the channel. Many sherds were abraded or fragile and could not be assigned a more precise attribution than (probably later) Neolithic/Early Bronze Age on the basis of fabric type and sherd finish. The bulk of the pottery was made from variously sized flint-gritted fabrics, with a few sherds also containing sand additives.

The combined pipeline and enhancement surveys indicate a variety of activities on and just above the river banks. Morever, they demonstrate that the area was repeatedly used as a focus for settlement and related activities in later prehistory. The east bank investigation area depicted a semi-sheltered occupation zone, off-slope from the higher chalk land mass, and at the junction of three palaeochannels of the Snail river system. In contrast, the evidence from the pasture field on the west bank of the channel junction concerned the lower-lying floodplain area, punctuated with small ponds and streams that provided the source of intensive work involving burnt flints.

V. The Snail palaeochannel and associated settlement remains

Combined with the examination of (lithic-dominated) occupation activity within the ploughzone, a second focus of investigation in the stripped easement was the Snail palaeochannel and its well-preserved waterlogged sedimentary history. At least three channels were evident topographically in the vicinity of the pipeline crossing of the Crooked Ditch (itself representing the most recent, partly canalised route of the Snail system), only one of which was trenched for pipe installation.

The palaeochannel sediments had initially been evaluated in a hand-excavated sondage during the route evaluation (F.6) and had yielded significant quantities of Early Neolithic flint blades and knapping debris caught in the sticky silty clay deposits against the eastern edge of the channel. A complete tiny thumb pot (38mm high, 5mm thick: Fig. 29.5) was also recovered from these silts. Made from crushed flint and shell tempered clay it had an inturned simple rim, 60mm in diameter, with trim marks evident on the external surface. The pot was extremely soft and unstable when first discovered: like the pot base found from channel edge deposits in one of the test pits (p.50, above) it did not seem to have been fired. Human bones were recovered from the upper peaty mud deposits in the centre of the channel where an aurochs (*Bos primigenius*) metacarpal was also found.

The channel's upper width was *c.* 25–30m at the confluence of the three evident stream courses. Its eastern edge sloped gradually and unevenly towards the base, *c.* 1.70m below the field surface (1.90–0.20m OD). The western edge was unavailable for excavation since it occurred so close to the western edge of the active Crooked Ditch. A second sondage through the channel sediments (F.200) was cut on the line of the proposed pipe trench and revealed the following sequence. A dark (near-black), wood-rich silty clay organic mud (*489*) occurred at the base of the channel, and contained large chunks of log wood and few visible molluscs. These primary muds were overlain by the main woody peat fill of the channel. Here, dark brown sand-rich silts (*488*) contained interleaved lenses of water-borne sands and silts, and conspicuous white layers of crushed mollusc shells. All combined to indicate different water velocities at work in the channel from time to time. Edge silts (*490*) were mottled and comprised different quantities of humic silts, sands and clays mixed with organic debris and crushed mollusc shells. The top of the profile featured a rich brown humic mud with abundant snails (*487*) and deep desiccation cracks. While the profiles of the two cuttings through the channel sediments (F.6 and F.200) were very similar, F.6 showed more variation at the top of the channel's profile with a distinct layer of off-white marl-like deposits, thought to be inwash sediments from the slope above the river's edge. While pale deposits were evident in machining the second sondage (F.200), they did not appear to be so contiguous or deep, suggesting that a greater localised dump of down-washed material altered the character of the upper channel sediments only 5m to the north. Micromorphological analysis of buried soils located on the east bank had shown clear signs of downwash, overbank flooding and edge erosion, and endorses the view of periodic colluvial action at this channel junction.

An aurochs metacarpal and human femur were recovered from the equivalent context of *488* in evaluation trench (*033*), while *490* (the edge silts) produced Early Neolithic flint tools, knapping debris, and the pygmy cup. Confirmation that these artefacts were *in situ* came from radiocarbon dating of a sample of wood from the middle of the humic silts (F.6, *036*) *c.* 0.60–0.80m below the stripped easement: 4460±70 BP or 3355–2910 cal. BC (Beta-77754). Bone bearing butchery marks (Luff, p.78 below), from higher up in the depositional sequence (F.200, *490*, 0.50–0.80m below the stripped easement) provided a slightly later Neolithic date of 4020±50 BP, or 2845–2830 and 2620–2450 cal. BC (Beta-77755: calibrated radiocarbon age ranges cited at 95% probability).

Turning to the environmental evidence, buried soil monoliths were taken from the upper edge of the channel profile as it sloped up to the apex of the bank. Micromorphological examination has identified the soil as a brown earth, common to woodland habitats, which was eroded by colluvial and alluvial action as a result both of clearance upslope and overbank flooding of the river. This is supported by the pollen evidence (Wiltshire, p.62 below), which also provides important new information for local landscape determination. Late Glacial taxa (arctic flora) from the lowest part of the pollen profile indicate that the palaeochannel sediments began accumulating in the early Flandrian. Higher deposits show a continuum of taxa for the subsequent major climatic periods: by Mesolithic and Early Neolithic times they indicate dense woodland on the riverbanks, including lime and oak. Lime is intolerant of wet conditions, which suggests either that the lime-dominated forest was set back from the river's margins, or that overbank flooding may have been seasonal (but not necessarily annual). An increase in molluscan freshwater slum taxa up through the deposits suggests a reduction in active flow and of overbank flooding from active channels nearby through time (Murphy 1996). Reduction in lime pollen and increasing levels of alder and hazel higher still in the profile reflect gradually wetter conditions. Fragments of the now extinct alder-leaf beetle *Agelastica alni* were found in the

SC4 pollen zone, dating to a period when the channel was dominated by alder carr. This coincides with a wider fen scenario where high water tables, caused by tree clearance and sea level rise, meant that many rivers and fen margins became blocked and show localised periods of stagnation in increased peat growths. Gradually, the pollen record shows the tree canopy opening as human colonisation of the banks increased and clearances were made in the woods. Inwashed sediments are seen in the top of all the environmental samples taken, showing the weakened stability of the soil on the river banks causing run-off into the channel, which eventually clogged. Assessment of the waterlogged insect remains (Robinson 1996) showed that about half the insects are aquatic species, the majority of which tend to be associated with stagnant or slowly flowing water (the water beetles *Dytiscus* sp. and *Hydrobius fuscipes*). Well-oxygenated moving water is also present as suggested by the presence of the *Elmis aenea* beetle, probably from episodes when the channel was flushed out by more major branches of the River Snail.

The distinctive signs of clearance, and of openings being created in an otherwise reasonably dense tree canopy of mixed deciduous woodland fringed by alder carr, are evident from the pollen boundary between zones SC4 and SC5 (*e.g.* before 3990–3710 cal. BC; OxA-6359). Wiltshire (p.75, below) attributes this clearance to the first major human colonisation of the river margins, rather than the less visible earlier (Mesolithic) excursions marked by the presence of microscopic charcoal. The major impact on the canopy shows up quite late within the sediments: around Late Neolithic/Early Bronze Age times the humic deposits that slowly infilled the channel revealed evidence of open grassland, disturbed soils and a diminishing tree line beside the channel as well as inland of it.

The edge of a wide contour gully of the palaeochannel system was investigated further east in the easement. Its form was not clear, as most of the feature and its depth lay beyond the area of excavation, downslope towards the present Crooked Ditch. A sondage through it produced prehistoric pottery, flint and bone.

The river bank pits

The dry chalk slopes of the Isleham 'mainland' give out to a clayish chalky marl base slope at the margins of the palaeochannel. Both river banks exhibited contrasting pit groups within the pipeline corridor.

East bank

The water-worn shallow slope of the east bank appeared pock-marked with small pits and depressions that were variously filled with clean silts with a medium-coarse grit component, finer humic clay silts, or humic loams mostly pale–mid greyish brown in colour. Distinguishing anthropogenic features from erosive 'swirl pools' (sometimes identifiable where a relatively large pebble or clusters of smaller pebbles remained in their bases) or tree/shrub boles was difficult in this terrain, and these difficulties were compounded by the presence of lithic material in many of them — whatever their origin. Diagnostic tools (end and thumbnail scrapers) from two of the pits, the presence of one certain stakehole (F.141, inserted at a 45° angle to the bank) and a post-hole, are suggestive of processing activities taking place at the water's edge. Standing at the edge of the channel in the stripped easement it was apparent that this shallow 'beach' — whether found or deliberately made — had been exploited for processing activities that took place within easy reach of the water source.

West bank

The western bank of the channel appeared less disturbed by water action than the eastern bank, yet still contained humic and silt-filled depressions in the top of the chalk marl substratum. The test-pit-based artefact survey (conducted prior to easement stripping) had already revealed copious quantities of burnt flints (*c.* 88kg) in the thin, formerly-ploughed pasture soil of the west bank, as well as the presence of more substantial cut features than those found on the opposite bank. The test pit excavations also showed that here, unlike on the eastern side of the channel, the edge was a well defined 'scarp', located on the outer edge of a curving forked junction. The main cut of the channel existed beneath the present course of the Crooked Ditch (which cuts the fork at an oblique angle) and on its north and east side, so that none of its sediments were available for study in the easement south of the Crooked Ditch (pipeline construction protocol also meant that investigation here was not possible).

Less than 2m from the western edge of the channel, four pits were filled with charcoal-rich dark greyish brown sandy humic loam deposits (F.129–132; Fig. 28 and Pls XV and XVI). These pits, 0.70–1.20m in diameter, were remarkable for the sheer quantity of burnt flint that they contained: 79kg was recovered from their half-sections and a further 4.8kg from a half sectioned pit found further west, in the evaluation trench. The pits are described as follows:

F.129 0.70m diameter; 0.25m deep. Steep edges, slightly undercut on the west side, flat base. Burnt flint content: 7.2kg; one dark sherd undiagnostic EBA pottery.

F.130 1.30m E–W, 0.70m N–S; 0.30m deep. Steep east edge, irregular west edge, slightly rounded base. Burnt flint content: 33.6kg; one sherd comb-decorated Beaker.

F.131 *c.* 1m diameter (irregular); 0.35m deep. Steep edges and sub-rounded base. East edge slightly slumped/undercut. Burnt flint content: 25kg; seven worked flints.

F.132 *c.* 1m diameter (irregular); 0.53m deep; three distinct fills. Irregular stepped edges rounding to pointed/conical base. Burnt flint content: 13.2kg; one worked flint.

The stratified find of decorated Beaker from F.130 provided a useful relative date for the pits and was endorsed by a radiocarbon determination of 2350–1945 cal. BC (Beta-77753). Like the sherd collected from F.129, no signs of burning were evident on it, so its incorporation into the pit was considered likely to be an incidental product of backfilling. Plant and mollusc remains indicate that these pits occurred in relatively wooded conditions but with open landscapes nearby. Two smaller, shallower pits containing similar humic fills were also examined (F.133, F.134). These proved to be artefact- and charcoal-free.

The abundant charcoal contained in F.132 was analysed by Rowena Gale (Table 14).

The charcoal corroborates the evidence of the pollen: that the dense mixed deciduous woodlands which grew along the river banks in the Neolithic had declined by the Bronze Age, probably as a result of land clearance prompted by a rise in the water table. Alder (*Alnus*), (the most common species represented), and hazel (*Corylus*) woods now proliferated on the wetter soils along the channel with open areas of grassland on drier land. Ash (*Fraxinus*) was also common in the

Context	*Alnus*	*Corylus*	*Fraxinus*	*Pomoideae*	*Prunus*	*Quercus*	*Taxus*
400	55r	1	6	2	3	12h	-
401	12	-	8hs	1	3	-	-
403	27	-	21	1	-	-	1

r = roundwood; h = heartwood; s = sapwood

Table 14 Charcoal fragments identified from F.132

charcoal; although characteristic of riverine sites it is unlikely to have tolerated the waterlogged soils and probably grew on drier land. Yew (*Taxus*) is a component of fen woods and, although the tree is vulnerable to waterlogging, the remains of many ancient trees have been recorded in situ on layers of wood peats, often on the banks of drainage channels (Godwin 1975a). Oak (*Quercus*) was identified only in the primary fill and may have been poorly represented in the environment.

These charcoal residues are likely to be the remains of fuel. Alder (*Alnus*) provided the main source, and was supplemented by other woods of higher calorific values but which were probably less widely available. The charcoal consisted of narrow stems (roundwood) and more mature wood, some of which included heartwood (oak (*Quercus*) and ash (*Fraxinus*). Its application as wood or charcoal fuel is not known. The denser woods (particularly heartwood) of ash (*Fraxinus*), oak (*Quercus*), blackthorn (*Prunus spinosa*), hawthorn (*Crataegus*), yew (*Taxus*) and hazel (*Corylus*) are more efficient as firewood than alder (*Alnus*) (Edlin 1949); ash has the advantage that it burns well when green (unseasoned). Although wood from a variety of species was used to heat the flints, the residues suggest that these were predominantly alder and ash. Alder burns slowly, but the addition of ash would have boosted the efficiency and heat of the fire. The high proportion of alder almost certainly reflects the abundance of this tree in the locality rather than its potential as fuel.

VI. Lithic analysis

(Figs 32–4)

A total of 957 pieces of worked flint were recovered during the various stages of field survey around the Snail palaeochannel, together with about 120kg of burnt flint (Table 15). A further 131 pieces of worked stone and 80kg of burnt flint were recovered during excavation.

Ploughsoil sampling

(Fig. 32)

The limitations of fieldwalking have already been described: peat deposits at the Snail sealed the artefact-rich buried soils of the old land surface, and the presence of a pasture field obscured land on the west bank. More representative results were gained from the test-pitting programme (TP1–85 located in a 10m-wide corridor to the west of the channel; TP86–160 to the east, where evidence for more than one phase of activity in the area was found). The assemblages are characterised by material which probably dates to both the earlier Neolithic and the Late Neolithic/Early Bronze Age. As at Site 4, local drift flint dominates, but raw material from primary chalk contexts is also well represented. Here, too, differences in the degree and character of cortication may relate to chronology, but this is difficult to test conclusively.

In technological terms, narrow flakes and true blades are numerous throughout the transect, some of them bearing limited retouch or damage indicative of use. Like many of the smaller, more irregular flakes, these pieces are characterised by small, trimmed platforms, indicating careful preparation prior to removal from their parent cores. Interestingly, many of these pieces display well-developed grey/white corticated surfaces. Further support for this pattern of working is demonstrated by the tendency for dorsal ridges and scars on many pieces to run parallel to the main flaking axis. Where two or more ridges are present, it is common to find that these, too, are parallel to each other. Many of the smaller flakes and chips are typical of the material generated during the routine preparation, trimming and maintenance of cores such as the classic (and heavily corticated) opposed platform example from TP68 or a narrow flake core fragment from TP116. This technological repertoire is typically associated with earlier Neolithic contexts and it therefore seems likely that the immediate area represented an important focus for activities at this time. This idea is supported by the presence of serrated blades in TP16 and TP28, a laurel leaf from TT36 and endscrapers in TP35 and TP27 (Fig. 32).

A small number of flakes from bifacial working were also recognised (*e.g.* in TP87). These included a relatively large mass reduction flake from TP12 which retained

Categories	*Field survey*	*Excavation*
Primary flakes	11	2
Secondary flakes	310	39
Tertiary flakes	599	70
Retouched flakes	44	14
Polished flakes	-	-
Blade/narrow flake cores	14	9
Discoidal cores	-	-
Multi platform flake cores	9	3
Endscrapers	6	2
Thumbnail scrapers	1	1
Sub-circular scrapers	2	-
Irregular scrapers	2	2
Leaf shaped arrowheads	-	-
Transverse/chisel arrowheads	1	-
Barbed and tanged arrowheads	1	-
Axes/Adzes	-	-
Fabricators/Rods	-	-
Chisel	-	1
Laurel leaf	-	1
Microliths	-	1
Borers	-	-
Hammerstones	-	-
Totals	**1000**	**145**

Table 15 Lithic categories from field survey and excavation at Site 6

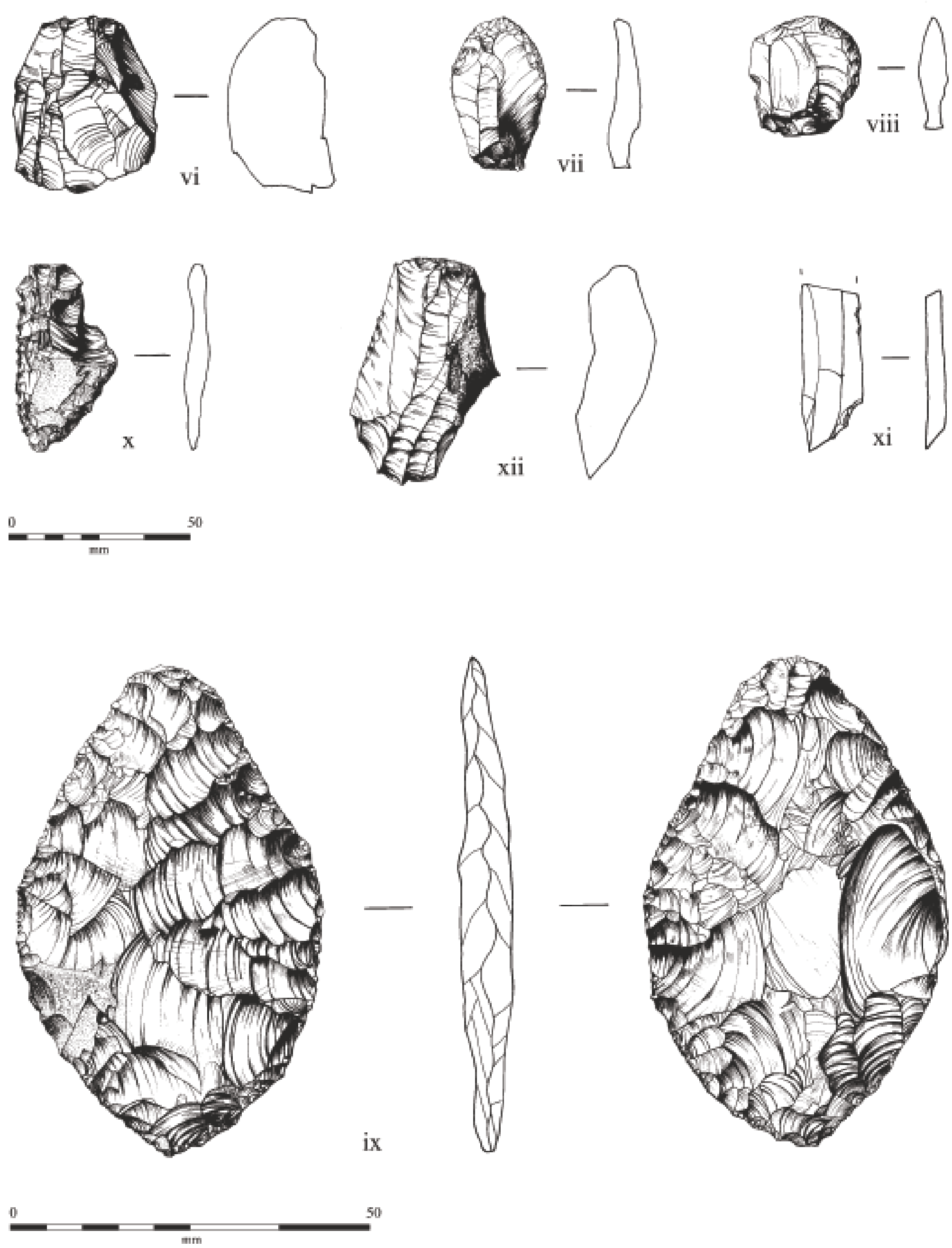


Figure 32 Selected lithic artefacts from survey and excavation at Site 6

scars resulting from working both edges of a large bifacial implement. Nodular fragments and secondary flakes with cortex on more than 50% of their dorsal faces also suggest the creation of cores from partially worked nodules. Interestingly, very little primary waste was recognised, suggesting that the initial stages of testing and core preparation took place elsewhere. In addition, larger, more angular flakes and core fragments were also present across the transect, many of them characterised by a rather poorly developed blue/grey cortical surface. For the most part, these pieces reflected a pattern of multi-platform core working which did not involve careful platform preparation prior to flake removal. As such, they may indicate a second horizon of activity in the area, dating to the later Neolithic/Early Bronze Age. This hypothesis is difficult to test on the basis of the waste alone, but some support is provided by the presence of thumbnail scrapers in TP21 and TP40, a chisel arrowhead in TP114, a crude but invasively flaked plano-convex knife from TP34, and a barbed-and-tanged arrowhead from TP36.

As noted above, test pits dug on the west bank of the Snail produced a large quantity of burnt flint. The frequency of pieces with evidence of working is relatively high, ranging from 60–70%. Burnt flint occurs in lower densities in the area corresponding to the eastern bank of the Snail, but here again there is a high frequency of material that was worked prior to burning.

The results of the test pit survey can be closely compared with the data from the excavations. The worked stone from the west bank of the palaeochannel is dominated by blades and narrow flakes, many of which show signs of having been utilised. These secondary and tertiary pieces are accompanied by secondary waste typical of that generated during the early stages in the preparation and reduction of narrow flake/blade cores, including fine core rejuvenation flakes. A small number of primary flakes are also present. Twelve cores/core fragments are also represented and include single and opposed platform blade/bladelet cores which demonstrate the careful preparation and control in flaking evidenced on many of the narrow flakes and blades. The high quality of the working on some of the blades would not be out of place in later Mesolithic contexts, and a presence in the area at that time may be indicated by a small, obliquely blunted point from TT36 (Fig. 32.xi). A second microlith, also a point on a fine blade, was recovered during backfilling. All of the other retouched artefacts are likely to date to the earlier Neolithic. These include a small laurel leaf, the tip of a crudely flaked chisel/fabricator broken during manufacture and a possible polissoir.

Enhancement survey
(Fig. 33)
These assemblages are technologically and perhaps chronologically varied. Secondary, and above all tertiary, flakes predominate, and attest to a variety of forms of artefact production and use, some of which are diagnostic of particular periods. The dominant technical activity represented across the area is the working of narrow flake and blade cores. Fine tertiary blades are present in many sampling units, and narrow flakes with parallel scars running down their dorsal surfaces are also well represented. Although snapped or otherwise broken flakes are common, those that retain their platforms show the small scars indicative of careful preparation prior to removal from their parent cores. The majority have thin, feather-like terminations and many are characterised by a heavy, grey-white cortical surface. This emphasis upon blades and narrow flakes is supported by the presence of cores and core fragments which reflect similar patterns of reduction. On the eastern side of the palaeochannel, these include the single-platform core associated with blades and bladelets in FW62, a blade/bladelet core in FW46, and further examples in FW16, FW88, FW89 and FW27. To the west, test-pitting resulted in the recovery of similar cores in TP51 and TP58 (Fig. 33). Blades and narrow flakes are also represented in this area.

Core working of this nature involves a relatively high degree of control, anticipation and routine maintenance. Platforms need to be established, sustained and occasionally rejuvenated, as do precise flaking angles

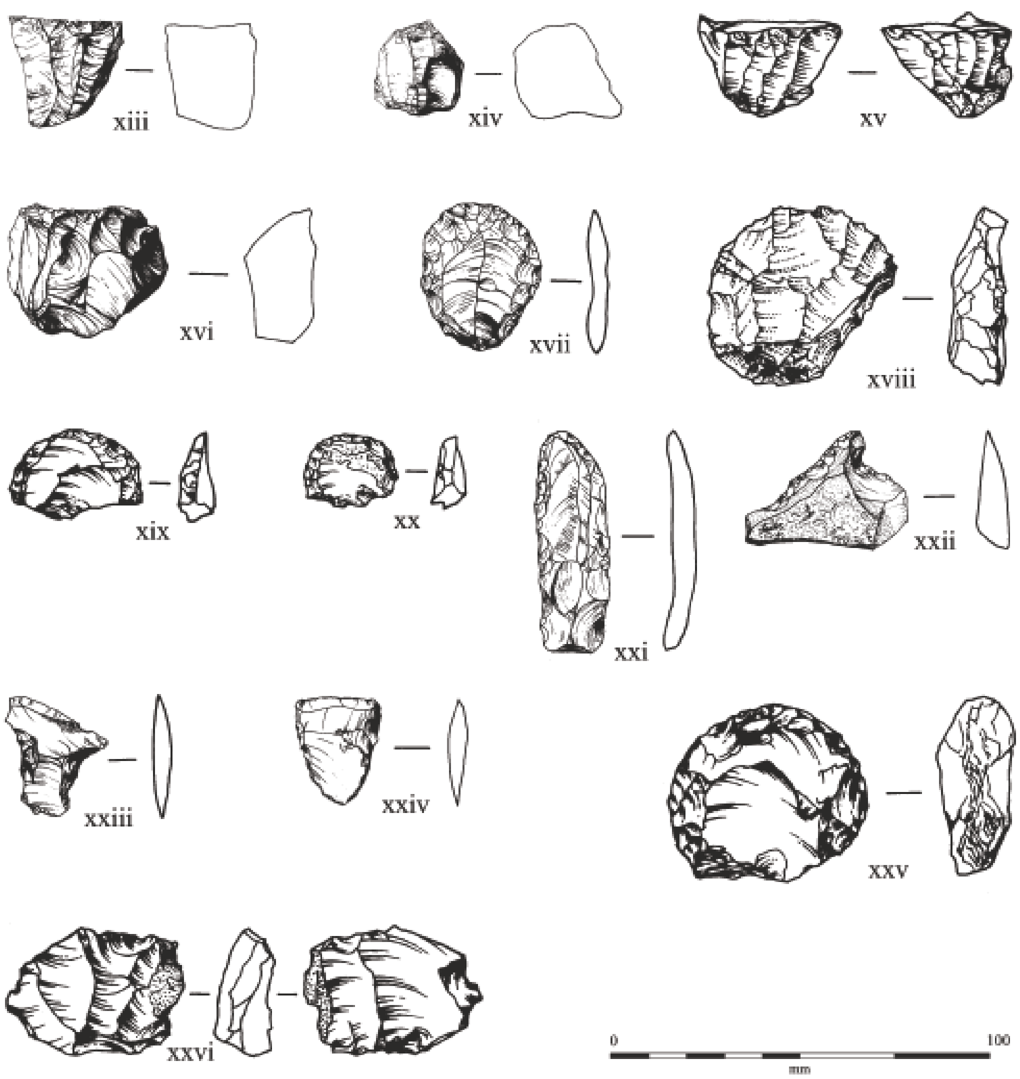


Figure 33 Selected lithics from the enhancement survey test pits and fieldwalking

between platform and core face. Invariably, these procedures result in the generation of small waste categories — trimming flakes, chips, spalls and rejuvenation flakes. Perhaps unsurprisingly, flakes with these characteristics are abundant throughout the survey area. Predominantly tertiary pieces, often retaining trimming scars running down from their platforms, these finds attest to the removal of platform crests, the adjustment of flaking angles and the creation of new platforms as a necessary and routine part of core working. The core rejuvenation flakes from FW25, FW78, FW79 and TP56 are likely to be associated with just such a pattern of working.

The scatters also contain evidence for rather different patterns of stoneworking. These are suggested by the presence of wide, circular or sub-circular pieces with acute platform angles and heavy platform faceting (*e.g.* FW16; FW8; FW24; and FW99). The majority have a thin, slightly curving profile, and frequently possess opposed or multi-directional scars on their dorsal surfaces. Flakes with these characteristics could be produced where cores were being worked from a number of platforms (particularly discoidal cores). However, similar forms are frequently generated during the thinning and trimming stages of working on large bifacial tools. Such activities also tend to result in the creation of smaller flakes with similar morphological characteristics, and it is interesting to note that these too are present in some number. While it is not always possible to separate these small flakes from those generated during the maintenance of cores (Burton 1980), it seems reasonable to infer that activities in the area also included the latter stages of bifacial tool reduction and maintenance.

In addition to narrow flakes, blades and biface flakes, the survey also resulted in the recovery of rather more intractable secondary and tertiary flakes. These included more angular and irregular flakes with little evidence for careful preparation prior to removal. Multiple orientations for scars on the dorsal face of many of these pieces suggest an association with multi-platform core working. These occurred across the full extent of the survey and could occasionally be distinguished by a poorly developed blue/grey cortical surface in contrast to the grey/white appearance of other material.

A relatively restricted range of forms are represented in the retouched assemblage. However, it is worth noting that the area has a long history as a focal point for local collectors, and it is known that large numbers of retouched artefacts (including at least thirty stone and flint axes) have been removed from the field prior to the fieldwork reported on here. Since these modes of collection usually place an overriding emphasis upon retouched forms at the expense of cores and waste, it is likely that this has introduced significant biases. Beyond simple retouched flakes and blades, the most common artefact identified during the survey was the scraper. Recognised scrapers include small 'horseshoe' or 'D'-shaped examples (*e.g.* FW67) and endscrapers made on narrow flakes and true blades. Like retouched and/or utilised flakes and blades, scrapers have a widespread distribution across the survey area and tend to occur in or close to the areas of high flint density. This kind of patterning is rather more difficult to demonstrate for other classes of retouched artefact, largely because they occur in very small numbers. These include a small fabricator with heavy wear on one end from FW73, a leaf-shaped arrowhead blank from FW25, a simple borer from FW90 and two chisel arrowheads from FW78 and TP49. The only other recognised type was a discoidal core from TP57 (Fig. 33.xxv) which had been re-used as a hammer.

Somewhat different in character but equally striking is the volume and character of the burnt flint. This was particularly widespread, with very few sampling units actually devoid of burnt material. However, distinctive clusters or zones of high density could be seen on both sides of the palaeochannel. To the east, these generally correspond to the areas where worked flint occurs in high densities, the one exception being the cluster centred on FW35, which contained *c.* 1.2kg of burnt flint. Burnt flint densities also appear to rise with proximity to the eastern bank of the palaeochannel. To the west of the palaeochannel, where test-pitting was the principal survey technique employed, high densities of burnt flint were recorded in the general area of four pits previously identified through excavation. Exceptionally rich in burnt flint deposits, it is likely that the truncation of these features may, in part at least, be responsible for the densities revealed during the survey. Putting to one side the heavily fragmented and shattered fraction on which no original surface can be seen, it is particularly interesting to note again that as much as 60–70% of the burnt flint recovered during the survey retains scars and surfaces indicating working prior to burning. Some pieces are clearly cores that have then been burnt (*e.g.* in FW14). Heavily burnt secondary/tertiary flakes and simple tools such as broken scrapers are also represented. Unfortunately, none of these tools proved to be sufficiently distinctive to support chronological inferences.

Excavated contexts

The evaluation trench (TT37) and easement traversed part of the peat-filled former course of the River Snail on the east bank. Here again, blades, narrow flakes and narrow flake cores were recognised, although in far smaller numbers than on the west bank. Small trimming chips and thin, broken flakes were also present, reflecting similar stoneworking activities to those seen in TT36. Rather more irregular secondary and tertiary flakes dominate, and the collection also contains large, angular and shattered fragments of chalk flint. Although several flakes display signs of wear, relatively few are formally retouched. Exceptions include a thumbnail scraper from F.142 (*422*), a poorly defined scoop/pit, and a small denticulated flake and an endscraper from F.138, another small pit.

By far and away the largest component of the assemblage from Site 6 is burnt flint. This material was concentrated in a line of four pits (F.129–132) on the western side of the Snail and amounted to *c.* 79kg. While the volume of burnt flint in these contexts is remarkable in itself, even more remarkable is the fact that *c.* 70% of the larger fragments retain flake scars or other traces of working. Core fragments are represented, often retaining a thin, abraded cortex, as are fragments of relatively thick flakes. Given the tendency for fragmentation on heating, it is perhaps unsurprising that smaller flakes are under-represented. Although the definition is poor, the cortex on many pieces suggests that the raw material was derived from the local drift geology.

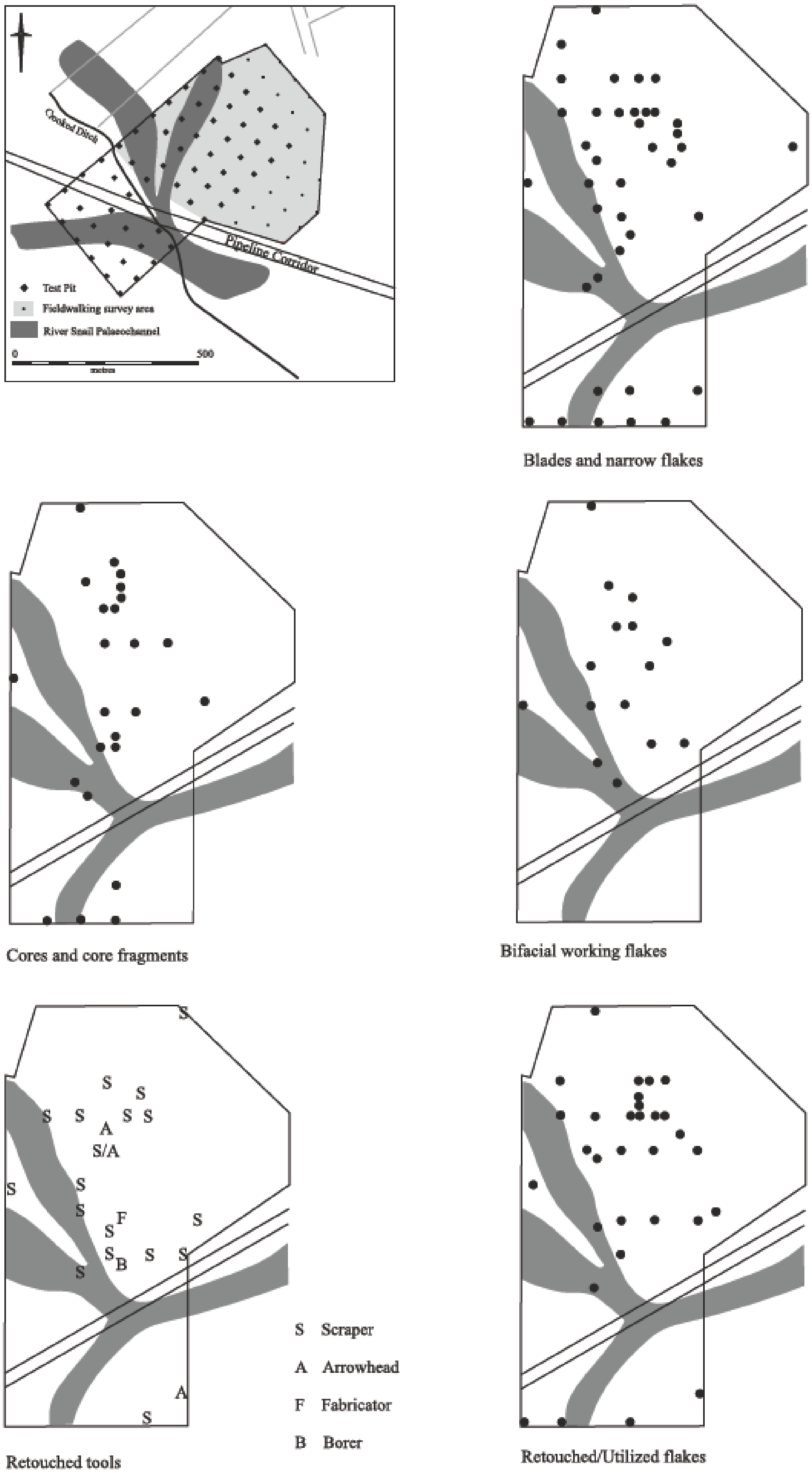


Figure 34 Distributions of tools and distinctive flake forms in the Enhancement survey area

Discussion

(Fig. 34)

The densities of material recovered from the environs of the River Snail are certainly striking. However, the date, character and duration of the activities that they represent are not easy to determine. The first highly visible expression of activity occurs during the earlier Neolithic, a period well represented on the margins of the river itself, and is attested by the spread of blades and narrow flakes and cores with similar technological characteristics (Fig. 34). An earlier Neolithic date may also be assigned to the serrated flakes/blades, the fabricator, and the possible leaf-shaped arrowhead blank.

Despite a strong earlier Neolithic presence, the possibility remains that some of this material, at least, is later Mesolithic. The presence of two microliths at Site 6 demonstrates that humans had at least a passing acquaintance with the immediate area during this period. Added to that is the observation that broad continuities in traditions of core reduction can sometimes blur the distinction between the later Mesolithic and earlier Neolithic, particularly in the absence of other diagnostic artefacts (Edmonds 1987; Holgate 1988; Pitts and Jacobi 1979). Some of the cores identified in the survey, particularly those corresponding to Clark's 'A1' type, have also been recovered in later Mesolithic contexts (Clark *et al.* 1960), and thus may indicate a rather longer pedigree for human activity in the area. Whilst only two microliths were identified in the course of the survey, it is possible that some of the endscrapers may also belong to this period. Although it is a rather poorly flaked example, one of the arrowheads may be equally early, belonging to Clark's category of later Mesolithic tranchet forms. Unfortunately, the spatial distribution of different categories of artefact does little to clarify the picture. For that reason, it may be best to assume that the area witnessed several episodes of activity spanning the 'transition' period, increasing perhaps in their density or duration with the development of the earlier Neolithic.

Just as chronology is difficult to tie down, so too are the character and duration of activities. Given the distributions, it is possible that our data reflect the use of the immediate area as a location for settlement. This gains added support from the range of material recovered. The reduction of cores, the working and maintenance of other tools and the use of flakes and blades — the range of tasks implied by this material suggests a varied suite of activities that might be anticipated on sites where occupation was more than 'event-like'. The high frequency of small chips and retouch flakes is also significant. Since the survey transects run across ground which slopes down to the river, some horizontal displacement of artefacts and colluvial movement may be expected. However, field experiments have shown that the potential for displacement (particularly in areas that have seen modern cultivation) is positively correlated with the size and weight of artefacts (Boismier 1997). For that reason, smaller chips, trimming flakes and retouch removals can often be regarded as more reliable indicators of *in situ* activity. As such, the widespread distribution of these smaller pieces may indicate an equally widespread pattern of activities involving stone-working.

The strong spatial correlations between the burnt flint and the eastern side of the Snail palaeochannel suggest that at least some of the spreads of this material may also date to this time, although the material itself cannot be dated with any accuracy. There is no reason to assume that the radiocarbon determination of 2350–1945 cal. BC for the burnt flint pits on the western bank can be applied to similar material elsewhere in the survey area. Often taken as a broad indicator of settlement, the distributions of burnt flint, particularly on the eastern side of the river, also seem to reflect the existence of several foci for activity. What these distributions actually represent is difficult to specify beyond the fact they reflect a concern with the systematic re-use of stone that had already served other purposes. However, since 60–70% of the larger fragments display signs of prior working, they add weight to the basic idea that this part of the Snail river system had become a focus for settlement.

If a varied range of activities are implied by the worked stone and the burnt worked flint, it remains to determine the scale and character of occupation near the Snail. Variations in artefact densities across the area might be partly explained by undulations in the underlying ground surface, resulting in differential exposure. However, the test pit survey suggests that these variations are as much a product of the organisation of prehistoric activity as they are a function of post-depositional factors. Given this, we can advance two broad scenarios. On the one hand, the data might reflect an extensive and substantial settlement. Alternatively, our patterns might also be explained as products of several 'episodes' of more limited settlement, extending perhaps over a number of years or even generations. This problem is difficult to resolve on the basis of the lithics alone. However, given available palaeoenvironmental data which suggest activities conducted in limited woodland clearings, the second of these interpretations seems more likely.

Later activity in the area, suggested by the radiocarbon determination from the burnt flint pits, finds relatively limited support in the evidence of the field survey. Very few truly diagnostic later Neolithic or Early Bronze Age artefacts were identified in either fieldwalking or test-pitting. However, at least two of the scrapers are classic 'thumbnail' forms and these, together with the barbed-and-tanged and chisel arrowheads, can probably be assigned to this later horizon. Core fragments and irregular secondary and tertiary flakes reflecting an emphasis upon multi-platform core reduction may also date to this time.

In raw material terms, the present data add local detail to our picture of procurement patterns in the region. Above all, the collections demonstrate the importance of the local drift series and chalk deposits as sources of workable stone throughout prehistory. Given the presence of mottled chalk flint artefacts amongst the earlier Neolithic material from the Snail enhancement survey, it is clear that this range was being exploited from an early stage, although it is currently impossible to be more precise regarding the specific location of sources. It is to be hoped that the detailed technological analysis of scatters near to known source areas may shed light on this question in the future. Since primary and early secondary working debris were under-represented in many assemblages, particularly those attributable to the later Mesolithic and earlier Neolithic, it may well be that these stages are more heavily in evidence at, or close to, the sources themselves. Crucial here would be the presence of initial testing and core creation debris, crested blades (where appropriate), and a high frequency of flakes with cortex on more than 75% of their dorsal surfaces.

It remains difficult to determine how far variability in the use of different materials is a function of change through time. Variability in the raw material structure of assemblages dominated by flint from the Isleham series drift may suggest that groups utilised a variety of specific source locations, further blurring any patterns arising as a result of intra-regional changes in the use of particular sources/deposits over time. However, it should be acknowledged that variations in the form, colour and composition of individual nodules may manifest themselves both within and between deposits over a relatively limited area. The clearest indication of change over time rests with the black, homogeneous flint that retains a thick, white cortex. Although it never dominated assemblages, this distinctive flint was most clearly in evidence on sites or in scatters with later Neolithic/Early Bronze Age affinities. For that reason, it is tempting to suggest that its presence marks the introduction of raw material derived from mined or otherwise quarried chalk sources. Current knowledge suggests that mining or quarrying for flint from chalk deposits in the region was a practice that rose to prominence in the later phases of the Neolithic, continuing into the earlier part of the Bronze Age. Nowhere is this more clearly demonstrated than in the evidence from Grimes Graves (Mercer 1981), further support provided by the observation that chalk flint was used to produce demonstrable later Neolithic artefacts such as transverse arrowheads or discoidal cores (Healy 1991). This material may reflect a subtle shift in the character of procurement and perhaps production during the Neolithic. Although these trends may relate to the loss of sources due to a rising water table (Brown 1996), they may equally reflect changes in the broader social and economic conditions under which particular materials were obtained and certain tools were produced (*ibid*.).

Putting to one side the origins of the flint, a particularly striking feature in many scatters is the amount of use that people seem to have made of stone. For the earlier periods represented in the survey, core-working traditions themselves reflect an emphasis upon the careful, systematic reduction of cores to produce blades and/or narrow flakes. Rejuvenation or recovery flakes attest to the maintenance of these cores, and the generally small size of many pieces suggests that working was often continued until cores were exhausted or broken. The persistence of these particular stone-working traditions has been seen by some as a function of broader patterns of settlement (Bradley 1987), reflecting the careful scheduling of procurement and raw material use by earlier Neolithic groups who retained a measure of routine mobility. This careful use of raw material also seems to have extended to its systematic recycling as stone for heating. At least some of the burnt flint scatters identified during survey may belong to the earlier Neolithic, and almost all reflect the heating of 'spent' cores, flakes and otherwise worked nodules. That said, burnt flint in demonstrably later contexts attests to its continued importance as an element employed in a variety of activities. The burnt flint pits from the western bank of the Snail palaeochannel (Site 6) also demonstrate the close correlation between major concentrations and proximity to water.

The relatively narrow corridor provided by the pipeline creates difficulties in establishing the broader spatial context of the scatters discussed here. In the case of the Prickwillow Road site (Site 1) further to the north-east, the evidence suggests that we have a small window on a far more extensive Late Neolithic/Early Bronze Age settlement located at the 'bottleneck' between the high ground of Isleham to the south-east and the main spine of the peninsula to the north-west (Gdaniec 1996; p.82, below). At Site 4, Chalk Farm South, it seems that the present data are derived from the margins of a settlement scatter whose focus lies further downslope towards the river. Here again, these later scatters reveal the use of local raw material and the primary chalk flint from further afield. The lack of any concentrations of primary or initial reduction waste in this latter material may indicate that at least some stages of working were conducted elsewhere, perhaps at the sources themselves.

The relatively restricted range of retouched tools identified in these later scatters is also interesting. Cores, retouched flakes and scrapers occur in some numbers, reflecting the use and discard of stone in a variety of practical tasks. However, only one barbed-and-tanged arrowhead was recognised, and there are very few 'heavy duty' stone tools or invasively flaked pieces. Although one might predict that these would be precisely the items selected by casual collection over the years, the virtual absence of these items from the present data set requires some explanation. Two possibilities present themselves. First, that these items are more heavily represented in areas of existing scatters that lie outside of the present survey area. Alternatively, the absence of these pieces may reflect important differences in the treatment accorded to different classes of artefact during prehistory. At least some of these scatters may reflect the disturbance of middens or related deposits of debris, and it may be that these were generally not the contexts in which certain categories of artefact were conventionally discarded.

VII. Palynological analysis of palaeochannel sediments

by Patricia Wiltshire
(Pl. XI; Figs 35–9)

A sediment column of 165cm was obtained from the palaeochannel of the River Snail for palynological study, and subsequent assessment showed the deposits to be polleniferous enough to warrant detailed analysis. The low organic content of the basal clay, and the composition of the palynomorph assemblage, suggested that accumulation of the channel sediments had begun in the early Flandrian. Subsequent radiocarbon dating showed that the sediment profile extended up to the Early Bronze Age and not only spanned the period of specific archaeological interest at the site, but also the whole of the Mesolithic period. Given the paucity of such early polleniferous deposits in East Anglia, the sediments of the Snail palaeochannel assume considerable importance for the understanding of both the Flandrian succession of vegetation, and the impact of early humans upon its development in this part of Cambridgeshire.

It is important to stress that while possibly being affected by processes controlling regional sedimentation patterns (*e.g.* marine incursions), the accumulation of deposits within the palaeochannel might also have been influenced by local water flow, erosion, flooding and *in situ* vegetation. It is possible, therefore, that the sedimentary sequence in the channel might not be closely reflected extra-locally or regionally. A summary of the Fenland Flandrian sedimentary sequences and other relevant palaeoenvironmental work is presented elsewhere (see above) but reference will be made here to specific studies where appropriate. Sediments were described in the field and the laboratory as follows.

Depth (cm)	*Description*
0–8	Grey/brown clay with fine sand and shell fragments
8–22	Brown clay with fine sand and shell fragments
22–37	Brown clay with fine sand/fine shell fragments with wood and twigs
37–87	Dark brown organic-rich, peaty clay with fine shell fragments and wood
87–128	Black peaty clay with abundant shell fragments and occasional wood
128–152.5	Black peaty clay
152.5–165	Light grey clay

Radiocarbon dating and statistical analysis

Eight samples of bulk sediment were submitted to the Oxford Radiocarbon Accelerator Unit. The samples were measured using accelerator mass spectrometry and were prepared using the methods outlined in Hedges *et al*. (1989). The conventional radiocarbon ages (Stuiver and Polach 1977) are quoted in accordance with the international standard (the Trondheim convention, Stuiver and Kra 1986). The calibrated results have been calculated using the data sets published by Pearson *et al.* (1993), and the computer program OxCal v2.18 (Bronk Ramsey 1995). Determinations have been calculated according to the maximum intercept method (Stuiver and Reimer, 1986), and all other ranges are derived from the probability method (Stuiver and Reimer 1993, van der Plicht 1993). Except where indicated, all radiocarbon determinations were calibrated to 95% confidence limits and quoted in the form recommended by Mook (1986), with the end points rounded outwards to ten years. The determinations were calculated to provide interpretative estimates by applying Bayesian statistics. Such estimates provide narrower ranges than those provided by calibration alone. The technique of 'Gibbs sampling' (Gelfland and Smith 1990) was applied using OxCal v2.18 (Bronk Ramsey 1995, Buck *et al.* 1991, 1992; Buck, Litton *et al.* 1994, Buck, Christen *et al*. 1994).

Linear regression was calculated by Cricket Graph V.1.3.2 (Cricket Software 1986–89). This was carried out to test the linearity of sediment growth. An index of sediment growth was calculated as follows:

$$\frac{1}{\frac{({}^{*}1-{}^{*}2)\times 10^{3}}{d}}$$

Where: *1 = mean of date range at depth
*2 = mean of date range at depth 2
d = depth of sediment between 1 and 2

Results

(Pl. XI; Figs 35–8)

The palynological results are shown in Figs 35–8. Figure 35 is a summary diagram showing palynomorph concentrations, major plant groups, fungi, algae, Cyanobacteria, and helminth eggs. Figure 36 shows all woody taxa plus cereal-type. Figure 37 is a plot of plant spore-producers (Pteridophyta and *Sphagnum*), plants of wet soils, and aquatics and emergents. Figure 38 shows monocotyledonous and dicotyledonous herbs. The detailed descriptions of sampling and analytical methods and of the local pollen assemblage zones are held in the site archive.

The radiocarbon results (Table 16) agreed with the stratigraphy and were statistically consistent. The ranges calculated to provide Bayesian estimates were disappointing because the samples were too widely spaced, and

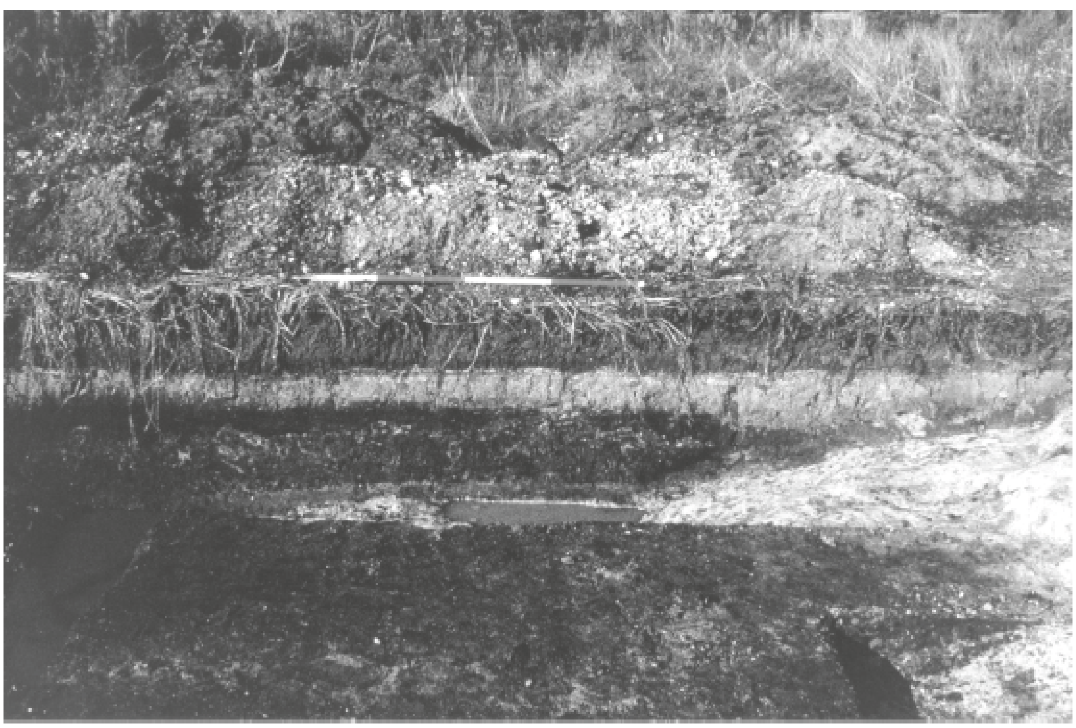


Plate XI Evaluation trench section through the Snail channel. The lenses marking downwash episodes are seen sealing the peat deposits. Mollusc-rich layers denoting higher velocity flow can be seen above the water line.

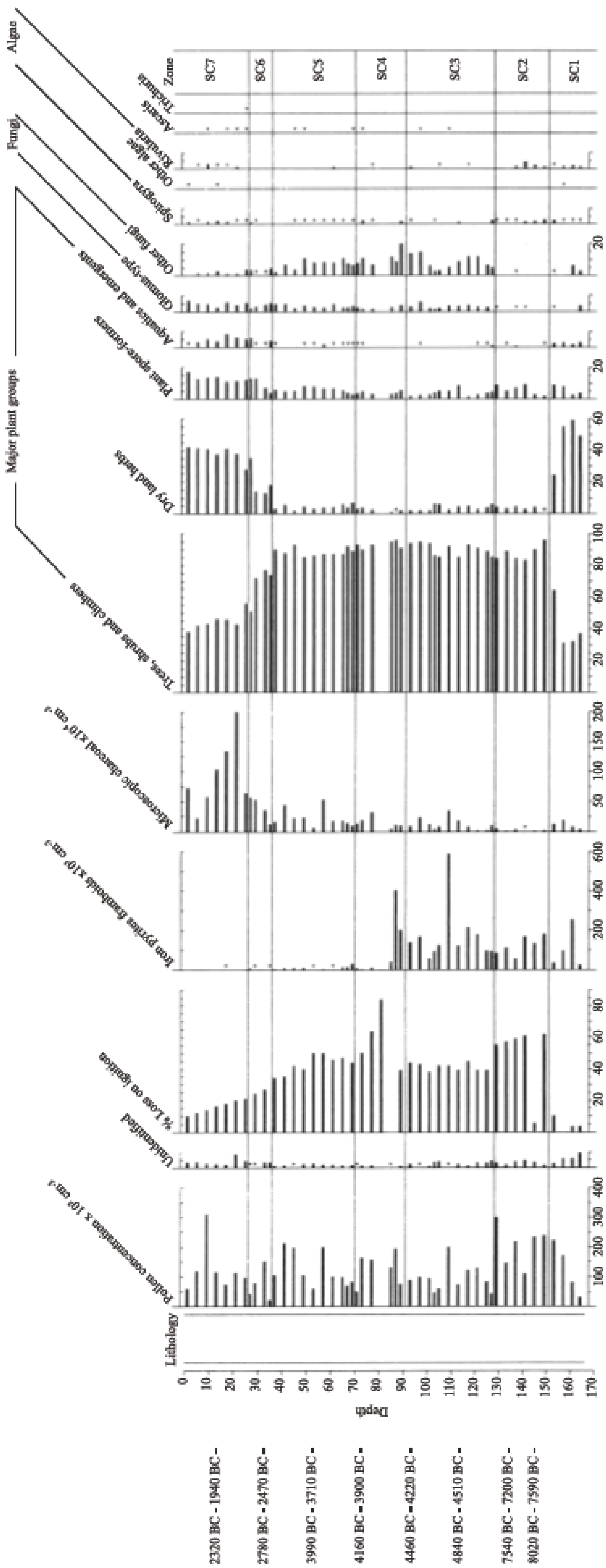


Figure 35 Pollen diagram: summary

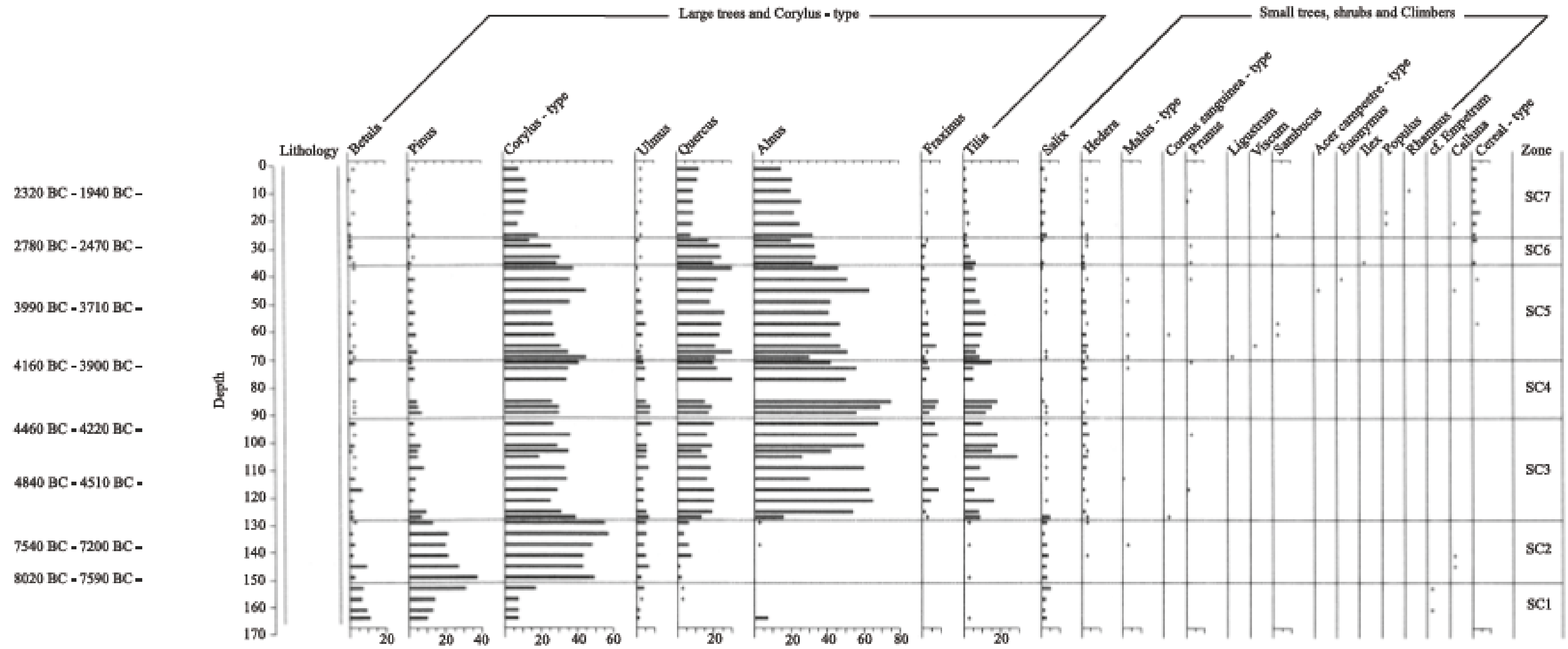


Figure 36 Pollen diagram: trees, shrubs and climbers

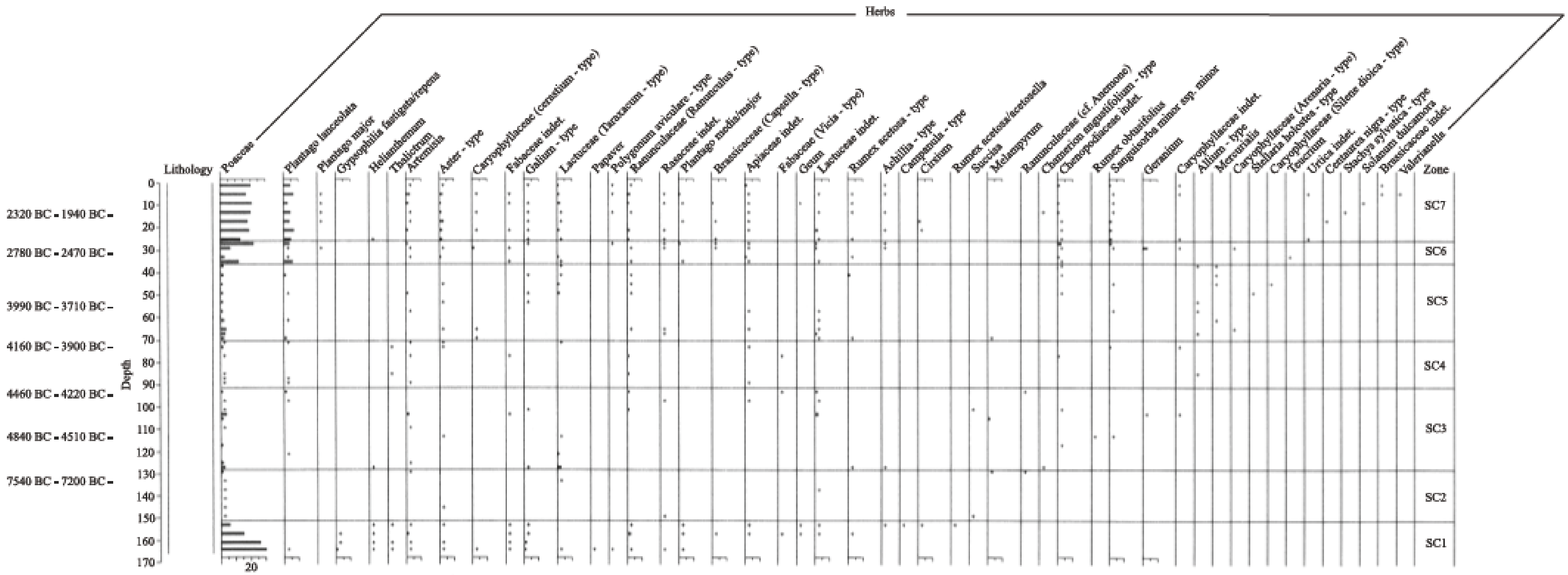


Figure 37 Pollen diagram: herbs

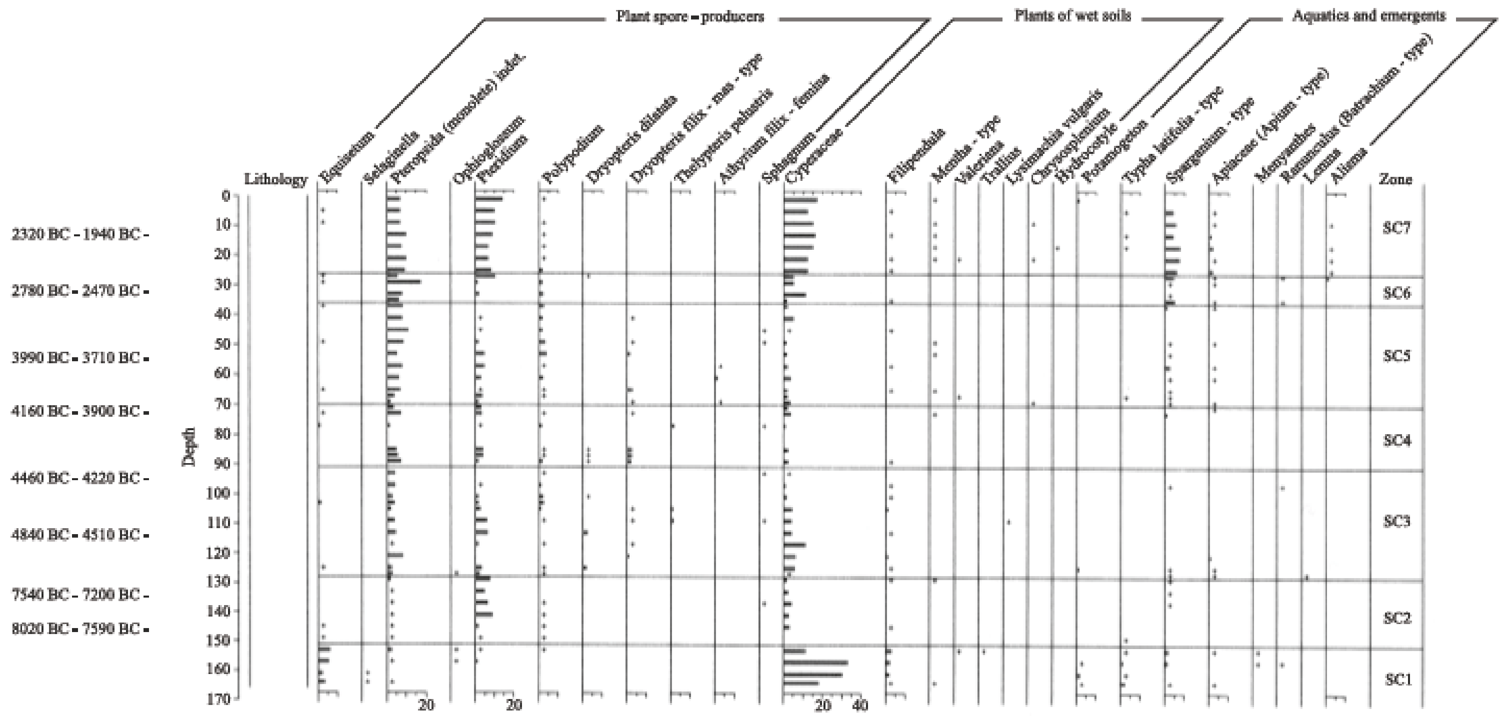


Figure 38 Pollen diagram: plants, aquatics and emergents

Lab sample no.	*Depth from top of pollen core (cm)*	*uncal BP*	*cal BC*	*Relative area under probability distribution*
OxA-6357	17	3735±60 BP	2320–1940 BC	100%
OxA-6358	33	4095±65 BP	2880–2800 BC	22%
			2780–2470 BC	78%
OxA-6359	57	5085±65 BP	3990–3710 BC	100%
OxA-6360	73	5185±65 BP	4230–4190 BC	6%
			4160–3900 BC	78%
			3880–3800 BC	16%
OxA-6361	97	5485±65 BP	4460–4220 BC	97%
			4190-4150 BC	3%
OxA-6362	117	5825±70 BP	4460–4220 BC	100%
OxA-6363	137	8355±80 BP	7540–7200 BC	92%
			7180–7140 BC	5%
			7120–7090 BC	3%
OxA-6364	149	8805±80 BP	8020–7590 BC	100%

Table 16 Accelerator radiocarbon dates from the Snail channel

the calibrated determinations are, therefore, presented in their original form. Figure 39 shows depth time curves for (a) the youngest and (b) the oldest extremes of the original calibrated ranges throughout the profile with a simple regression line on each plot. Plotting of the midpoints of the ranges gave the same pattern and is not shown. Also plotted is (c) the range for each radiocarbon estimation together with (d) a plot of the sediment growth index for deposits intercalated between radiocarbon determinations.

Local pollen assemblage zones

Zone SC1

The low organic content of the basal grey clay, the relatively high percentage of unidentifiable palynomorphs and low palynomorph concentrations at the base might suggest that there was some active flow in the channel in Zone SC1. However, the progressive rise in palynomorph concentration and fall in unidentifiable grains indicates gradual stabilisation and, perhaps, a slowing-down of sedimentation rate.

The relatively high concentrations of iron pyrite framboids suggest that if moving water was present, its flow must have been very sluggish. Framboidal ferrous sulphide is derived from the microbial reduction of iron and sulphate ions. Framboids usually form at the sediment/water interface and will only develop in conditions of very low redox potential (Eh = –100 to –150mV) where there is a source of detrital iron, sulphate ions, and the by-products of fermentation of organic material (Wiltshire *et al*. 1994). They are generally indicative of waterlogged soils or sediments where water is stagnant or moves slowly, and where decomposition of organic detritus is *via* fermentation. The low organic content of the clay certainly does not seem to have been limiting to framboid production, and the clays would probably have provided a source of detrital, ferric iron. The presence of *Glomus*-type vesicles of arbuscular mycorrhizal fungi *sensu* (Bagyaraj and Varma 1995) indicates that bioactive soils might have been washed into the channel and these would also have provided detrital iron. Arbuscular mycorrhizal fungi form mutualistic symbioses with a very wide range of plants although they are absent from aquatic families such as Nymphaeaceae (water lilies) and Menyanthaceae (bog beans), and are formed only sparsely in certain other herbaceous families such as Cyperaceae (sedges). They develop most prolifically within the roots of plants growing in relatively warm, aerated soils which are relatively deficient in nutrients, especially phosphate (see Werner 1992). The presence of arbuscular fungal vesicles in channel sediments might, therefore, indicate some instability and erosion of soil and/or plant roots into the channel.

The vegetation in the channel and on its banks probably contributed to the stabilisation of the accumulating sediment. The aquatic alga *Spirogyra*, and Cyanobacteria such as *Rivularia* were well represented. These both favour nutrient-enriched, stagnant water, and relatively high light intensities (Round 1981) and are considered to be algal and bacterial 'weeds'. Well-lit stagnant, or very sluggishly moving, water is also indicated by the presence of obligate aquatics such as *Potamogeton* (pond weed), *Batrachium*-type *Ranunculus* (*e.g.* water crowfoot) and *Apium*-type (*e.g.* fool's water cress). The channel, or the adjacent banks and wet soils, supported taller vegetation such as *Sparganium*-type (*e.g.* bur-reed), *Typha latifolia*-type (*e.g.* greater reed mace), Cyperaceae (sedges), *Equisetum* (horsetails), and *Filipendula* (meadow sweet), as well as herbaceous plants of small stature such as *Mentha*-type (*e.g.* water mint), *Valeriana* (*e.g.* marsh valerian), *Trollius* (globe flower), and *Selaginella* (clubmoss).

Conditions in the environs of the channel were fairly open, and trees and shrubs reached less than 40%. Herb-rich 'meadow' and grassland was important with *Poaceae* (grasses) accounting for 30% of the pollen sum in the basal sample, although there was a gradual decline towards the zone boundary. Many of the herbs found in the zone were ruderals, or were characteristic of open grassland. There was also a strong Late Glacial element to the local vegetation such as *Empetrum* (crowberry), *Gypsophila* (fairy breath), *Helianthemum* (rock-rose), *Artemisia* (mugwort), *Thalictrum* (meadow rue), and *Ophioglossum* (adder's tongue fern).

The woodland was dominated by *Pinus* (pine) and *Betula* (birch), but *Corylus*-type (*e.g.* hazel) and *Ulmus* (elm) were also present at low level in the catchment. *Salix* (willow) was probably growing very close to the pollen site, and *Ulmus* (elm) and *Quercus* (oak) had colonised the area. The picture gained from the pollen spectra is one of a largely open, herb-rich, landscape with stands of *Pinus*, *Betula*, and *Corylus*. *Salix* and tall herbs such as Cyperaceae, *Filipendula*, *Valeriana* and monolete Pteropsida (*e.g. Thelypteris palustris* — marsh fern) fringed a sluggishly-flowing water course which was becoming choked with water plants and algae. Wet meadow, grassy areas and open, disturbed soils supported a wide variety of herbs, including plants which were common in the Late Glacial and early Flandrian landscape. *Alnus* (alder) and *Tilia* (lime), which were found in the basal sample, were unlikely to have been derived from living plants in the catchment, and probably represent pollen reworked from older sediments.

The presence of small amounts of microscopic charcoal in every sample suggests that people were active in the locality, although the possibility of natural fires cannot be discounted. The low levels of charcoal might indicate that exploitation of the area was at low level, or that the centre of activity was some distance away from the channel. There is certainly no evidence of large-scale burning of the landscape, at least within the catchment of the channel.

The pollen spectra are characteristic of those recorded at other sites for the beginning of the Flandrian (Holocene) in Britain, and Zone SC1 is probably equivalent to the Pre-Boreal period of Blytt and Sernander or Zone IV *sensu* Godwin (1940b; 1975a and b). The decline of *Betula* and Poaceae and the increase of *Pinus* and *Corylus* towards the end of

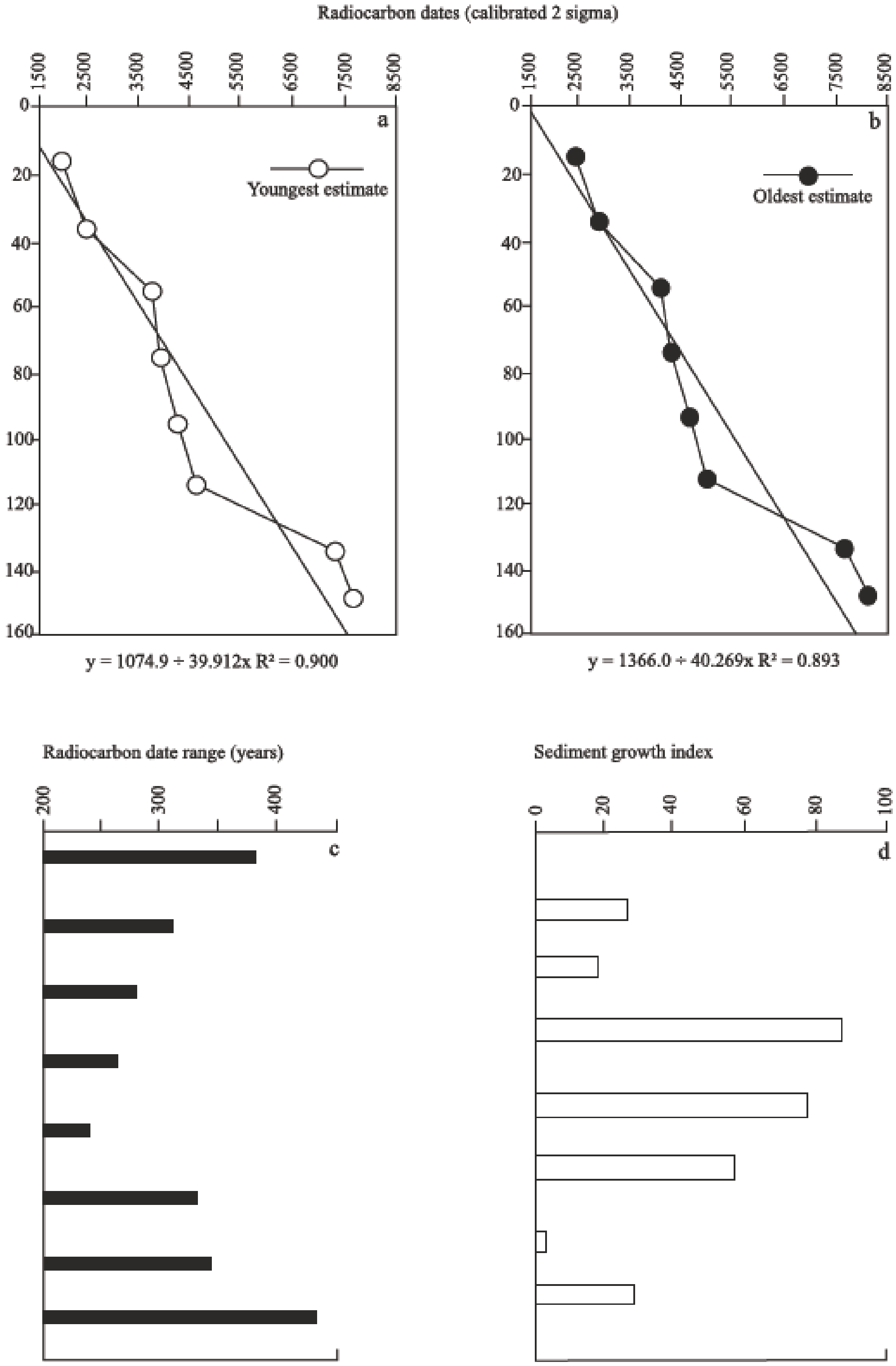


Figure 39 a: depth time curve (youngest estimate); b: depth time curve (oldest estimate); c: radiocarbon date ranges; d: sediment growth indices

the zone suggest that the succession of Flandrian woodland was well under way.

No radiocarbon determination was obtained for this zone and interpretation of its temporal status within the sequence depends on its vegetation characteristics. Furthermore, without dating, it is impossible to assess the rate of sediment accumulation.

Zone SC2

The high palynomorph concentrations and organic content indicate that productive vegetation was well established at the beginning of the zone. The adjacent soils appear to have stabilised, since *Glomus*-type fungi were sparse. For *Spirogyra* and *Rivularia* to be so well represented, standing water must also have been available, possibly seasonally. There must also have been enough light penetrating the canopy to allow algal growth although, of course, this might have been in spring before bud burst. The presence of *Hedera* (ivy) also suggests openings in the canopy, but this climber flowers in late autumn (Grime *et al.* 1988) and its pollen could have been derived from a plant supported by a tree on drier soil just a little distance away from the channel edge.

The sediment was highly organic and humified, and this suggests that periodic drying and aeration of the surface allowed good decomposition of organic detritus within the channel. The range for the radiocarbon estimation at 149cm is 430 years (Fig. 39c) and this relatively poor resolution also suggests a high level of humification (and thus slow growth) of the peat. Drier conditions are also indicated by the marked decline in aquatic, emergent and tall herb vegetation, while the relatively abundant *Salix* throughout the zone suggests that the shrub was growing prolifically in or adjacent to the channel. The radiocarbon determination at 137cm (Fig. 39c) has a range of 340 years and this might indicate a slightly faster peat growth in this sample. *Sparganium*-type entered the record at this depth and *Sphagnum* moss was recorded. It is possible, therefore, that conditions were a little wetter in the channel in the upper part of the zone and this might support the contention of faster peat growth. Although the ranges for the two radiocarbon estimations suggest slightly different rates of growth for the peat in each sample, the peat growth index between 137cm and 149cm is 30. There is no evidence for flowing water in the channel within this zone, and the sediment/water interface was anaerobic enough to allow the formation of high levels of iron pyrites framboids.

The sharp change in lithology between Zones SC1 and SC2 is reflected in a very marked difference in the pollen spectra and it is obvious that the resolution in the data over the boundary is very crude. This could be due to intense concentration of palynomorphs through high levels of humification of the organic matrix, or there could be a hiatus in the record. There might have been some active flow within the channel during the period represented by the zone junctions which could have prevented the accretion of organic debris, or physically scoured out accumulated sediment. This means that the sediments of Zone SC2 lie unconformably on those of SC1 and some (unknown) degree of the vegetation record has been lost.

Throughout this zone, the landscape was dominated by *Pinus* and *Corylus* woodland. *Betula* (an early coloniser in succession) had declined, presumably through being out-competed by the more shade tolerant trees, but *Ulmus* and *Quercus* had become well established in the catchment. *Tilia* was represented by single grains in three samples in the zone: although this is low representation, the poor pollen productivity and dispersal of this insect-pollinated tree suggests that it was growing in the environs of the channel rather than some distance away. *Alnus* was also found as single grains but, considering its very high pollen productivity, it is likely that it was growing some considerable distance away from the site. Throughout the zone, *Pinus* declined in favour of the broad-leaved trees; at the end of SC2, the area seems to have been dominated by *Corylus* woodland with an understorey of *Pteridium* (bracken), and other ferns. With the very low representation of Poaceae and other herbs, the woodland seems to have been very dense although some gaps in the canopy must have been available to allow *Calluna* (heather) to flower. This dwarf shrub can grow vegetatively in woodland on acid soil but needs light for flowering (Gimingham 1972).

Although present in every sample, microscopic charcoal was found at very much lower levels than in the previous zone. This need not imply a lesser human presence since the dense vegetation might have acted as a barrier to charcoal particles filtering into the site.

As already noted, the very marked changes in the lithology and pollen spectra indicate poor resolution in the data over the boundary between Zones SC1 and SC2. This could be due to concentration of palynomorphs through high levels of humification of the organic matrix. On the other hand, it could also be due to a loss of peat through active water flow in the channel.

Zone SC3

The matrix of the sediment in this zone was similar to that in Zone SC2, except that the deposit contained abundant mollusc shell fragments and occasional wood fragments. The sedimentary environment was certainly different from conditions in SC2 since palynomorph concentration and organic content were lower while iron pyrite framboids were, overall, more abundant. The site seems to have become wetter since aquatics, emergent plants, and tall herbs were better represented, although *Spirogyra* and *Rivularia* were present only sporadically. The marked increase in *Glomus*-type, and the dramatic increase in spores of other fungi, show that bioactive soil was eroding into the channel and, probably, that infected plant litter was contributing to the organic fraction of the sediment. *Salix* was no longer such an important member of the community around the channel. There was evidence for the presence of standing water and wet fen, since *Potamogeton*, *Lemna* (duck weed), *Sparganium*-type, *Apium*-type, and *Batrachium*-type *Ranunculus* were found, while fen conditions are also indicated by the fern *Thelypteris palustris*, Cyperaceae, *Equisetum*, *Filipendula*, and *Lysimachia vulgaris* (yellow loosestrife). There was no indication of active water flow from the palynological data.

The peat growth index between the radiocarbon determinations at 137cm and 117cm is only 7.0. This suggests that between these depths peat accumulation was very slow indeed, rendering the sampling resolution too crude to follow vegetation change. However, if the 20cm of sediment between the two estimates accumulated without interruption it would represent approximately 2700 years, and this is highly unlikely to be the case. It is possible that the channel had become reactivated so that peat accumulation was prevented by a continuous or frequent flow of water. But, if this were the case, depending on the velocity of water flow, an accumulation of mineral particles of various size classes might be expected to be significant components of the sediment. The organic content of the sediment remained very high and no mineral bands were detected in association with the hiatus, so it is probable that a significant amount of sediment has been lost from the channel. The change from a shell-free peat to one where mollusc shell fragments were abundant suggests that more water came into the system in Zone SC3, and it is likely that the peat was lost through scouring action. This could have happened over a very short space of time. The sediments of SC3 thus lie unconformably on those of SC2 and a good deal of vegetation history of the site has been lost. Within Zone SC3, the peat growth index reached a value of 60 and the range of the radiocarbon determination at 97cm was 240 years (Fig. 39c and d). Figures 39a and b also show that peat accumulation between 117cm and 97cm was the most rapid in the whole profile.

The zone is characterised by a massive and sudden increase in *Alnus*, *Quercus*, and *Tilia*, the appearance and expansion of *Fraxinus* (ash), and the marked decline of *Pinus* and *Salix*. However, these marked changes reflect a hiatus in the vegetation record.

The channel itself probably supported dense alder carr but the surrounding woodland seems to have been more diverse than before. Small trees and shrubs such as *Malus*-type (*e.g.* crab apple), *Cornus sanguinea*-type (*e.g.* dogwood) and *Prunus* (*e.g.* sloe) were represented, and there was a marked increase in abundance and frequency of *Hedera* and ferns. The richness of the fern flora is another indication of increasing diversity of the vegetation in the catchment. Monolete Pteropsida (undifferentiated ferns), *Pteridium, Polypodium, Dryopteris dilatata* (broad buckler fern), *Dryopteris filix-mas* (male fern), *Thelypteris palustris* and *Ophioglossum* were all represented in the various communities growing in the vicinity.

Poaceae were still at low level but a much wider range of herbs was represented than in Zone SC2. These included those characteristic of open woodland glades and burned, disturbed woodland such as *Melampyrum* (cow wheat), and *Chamerion*-type (*e.g.* rose-bay willow herb), as well as those of open disturbed soils and pasture such as *Plantago lanceolata* (ribwort plantain), *Taraxacum*-type (*e.g.* dandelion), and *Sanguisorba minor* ssp. *minor* (salad burnet).

The overall assemblage suggests that although woodland must have been very dense in the local and extra-local landscape, there were openings and glades where the vegetation was more diverse and productive. Herbs of small stature were able to grow, and trees and shrubs which would provide useful food for humans and animals were able to flower and, presumably, produce fruit. The low representation of Poaceae pollen might conceivably be due to grazing pressure in glades so that few grass plants were able to reach the flowering stage.

Microscopic charcoal was present in every sample and there was a significant increase from 113cm upwards. It is difficult to know whether this increase is a function of better accessibility of smuts to the channel because of the presence of adjacent glades, or a real increase in fire frequency and greater proximity to the site. The pollen spectra indicate that conditions throughout the zone were rather uniform although the expansion of *Tilia* at the expense of *Alnus, Quercus* and *Corylus* at 105cm and the increase in charcoal between 113cm and 105cm might suggest human interference with the woodland.

Zone SC4

The very great increase in organic content of the peat was probably due mainly to wood which had fallen into the channel within the carr. Indeed at 81cm the sample consisted of very humified wood and contained virtually no other palynomorphs. At the beginning of the zone, the high levels of framboids showed the peat to be waterlogged and sulphidic. However, at 81cm, framboid levels declined markedly — indeed, almost to extinction. The very low levels of aquatics and emergents and the sporadic presence of algae suggest that conditions in the channel were drier.

It is probable that the large amounts of wood and debris from the carr vegetation raised the peat surface above the water; the high level of lignin in the litter was reflected in the colour of the peat which was brown rather than black. The presence of fine shell fragments suggests that the channel was damp. Although conditions were wet enough to allow peat to accumulate, redox potential was probably too high for framboid formation, though possibly low enough for preservation of palynomorphs. *Glomus*-type was present, but at reduced levels; soil eroding into the system might thus have been less, and could mean that detrital iron levels were insufficient for framboid formation. The abundance of other fungal spores probably indicated the large amounts of leafy material available for decomposition in the sediment.

The radiocarbon determination at 73cm had a range of 260 years and the peat growth index between this and 97cm was 80. Thus, peat growth was rapid and dating resolution was relatively good. The fast accumulation was probably due to the large proportion of woody debris generated within the carr and the relatively slow rate at which it decomposes when compared to material with less lignin.

The channel and its environs supported very dense alder carr with *Salix*, ferns, and *Sphagnum* and, early in the zone, *Alnus* accounted for 75% of the pollen sum. Considering the percentage of organic content in the sediment, the amount of organic debris within the carr must have been very great (Fig. 38). *Betula*, *Fraxinus*, and even *Corylus* might have also been growing in the carr itself, but *Ulmus*, *Quercus*, and *Tilia* were growing on drier soils in the area.

After the hiatus created by the wood in the sample at 81cm, changes in the woodland are evident. *Alnus*, *Ulmus*, *Tilia*, *Fraxinus* and *Pinus* declined while *Quercus*, *Corylus* and *Hedera* increased, and there was an increase in the frequency of dry land herbs. Poaceae were very poorly represented but, in spite of the dense local woodland, there must have been small areas among the trees which offered openings to allow herbs such as *Plantago lanceolata*, and other grassland plants and ruderals to grow. Openings in the canopy are also indicated by a marginal increase in *Hedera* and the presence of *Malus*-type and *Prunus*; all of these species need good illumination for flowering

Microscopic charcoal also increased in the upper part of the zone and it is likely that people were exploiting the woodland.

Zone SC5

There was no change in the stratigraphy at the boundary between Zones SC4 and SC5 and all except the uppermost sample in the zone were taken from the same lithological unit. Compared with the previous zone, there was little change in palynomorph concentration, but framboids became a little more abundant just about the zone boundary and then occurred at low level throughout. As these can indicate waterlogged conditions, it is probable that their low frequency was due to any standing water being shallow enough for oxidising conditions to prevail in the sediment for considerable periods. An increase in wetness is also indicated by the frequent occurrence of aquatic and wetland taxa such as *Spirogyra*, *Typha latifolia*-type, *Sparganium*-type, *Apium*-type, *Filipendula*, *Mentha*-type, *Valeriana*, Cyperaceae, *Equisetum*, *Thelypteris palustris*, *Sphagnum* and *Chrysosplenium* (golden saxifrage).

The radiocarbon determination at 57cm had a range of 280 years and the sediment between 73cm and 57cm had a sediment growth index of 90, the highest in the whole sequence. Figure 39a–d shows graphically the high rate of sediment accumulation in this lithological unit, and the falling organic content might indicate that this was probably due, at least in part, to soil erosion into the channel. The consistent rise in *Glomus*-type certainly suggests an input of bioactive soil to the system.

The boundary between Zones SC4 and SC5 was placed just before *Ulmus* declines almost to extinction. It is interesting that *Corylus*, *Alnus*, and *Fraxinus* behave in a reciprocal fashion to *Ulmus* and *Tilia* in the pollen diagram — they have a sustained decline and then recover towards the end of the zone while *Ulmus* and *Tilia* rise and then fall. *Salix* also disappears and reappears in the record during the recovery of the *Corylus*/*Alnus*/*Fraxinus* woodland. *Quercus* declines at 53cm and then gradually recovers towards the end of the zone.

To a large extent, these patterns probably indicate the varying fates of specific stands of vegetation. It is likely that *Corylus*, *Alnus*, *Salix* and *Fraxinus* were all components of the local and *in situ* vegetation, while *Ulmus*, *Tilia* and *Quercus* were growing on drier soils away from the direct influence of the channel. The rise and fall of *Ulmus* and *Tilia* might simply reflect better pollen dispersal during the time when the dominant trees in the channel were reduced. The pattern of the *Quercus* curve in the diagram also suggests that its apparent decline at 49cm could be a statistical artefact of data representation and that, in reality, *Quercus* was little affected. However, there is little doubt that selective clearance of trees was occurring and the resources of the fen carr were being exploited extensively.

The opening of the canopy of the carr certainly had the effect of increasing the species richness in the pollen record. A large number of shrubs and small trees (nearly all insect-pollinated and, therefore, poorly dispersed) were recorded, including *Malus*-type, *Cornus sanguinea*-type, *Prunus*, *Ligustrum* (privet), *Sambucus* (elder), *Acer campestre*-type (field maple), *Euonymus* (spindle), and *Viscum* (mistletoe). The presence of *Viscum* is interesting and it could have been parasitising a number of the trees growing in and at the edge of the channel. It particularly favours *Tilia* and *Malus* although it has a wide host range (Stace 1991). If it were growing on either *Tilia* or *Malus*, then these trees must have been growing very close indeed to the channel since *Viscum* pollen would be unable to travel far from source.

It is, of course, possible that water flowing in the channel brought pollen from outside the immediate catchment, since it is well known that streams can carry pollen loads considerable distances (Peck 1973) and the site certainly seems to have become wetter. However, there was no convincing palynological evidence for substantial flow through the channel and it is more likely that these shrubs and trees were genuine components of the local vegetation.

The increase in wetness and light certainly affected the herbaceous flora, and both wetland plants and woodland ferns including *Polypodium*, *Dryopteris filix-mas*-type, and *Pteridium*, and herbs including *Allium*-type (*e.g.* ramsons) and *Mercurialis* (dog's mercury) were more abundant and diverse. Dry land herbs including ruderals, grasses and grassland plants such as *Plantago lanceolata*, *Taraxacum*-type, and *Ranunculus*-type (*e.g.* buttercup) also increased in frequency and abundance.

It is notable that cereal-type pollen was found at 57cm and 41cm, and microscopic charcoal levels, although fluctuating, were higher than before. It is highly unlikely that these cereal-type pollen grains were of *Glyceria* (sweet grass), whose pollen can be confused with that of early cereals, since the site would have provided a suitable habitat for *Glyceria* long before this period. These changes in the local and extra-local vegetation, and the presence of cereal pollen and of so much charcoal, indicate that people were not only exploiting the woodland resources in the vicinity of the channel but were farming purposefully-created clearings. The intermittent finds of intestinal parasite eggs also confirms that faeces were being deposited into the channel. Its use for the watering of domestic animals cannot be ruled out.

Zone SC6

The lowered palynomorph concentration, slightly higher percentage of unidentifiable grains, and progressive lowering of organic content probably indicates a continuing input of minerogenic material into the sediment, probably from erosion of adjacent soils and subsoils. *Glomus*-type was certainly well represented throughout the zone. The system also seems to have become even wetter than the previous zone with marked increases in wetland plants, particularly Cyperaceae, *Sparganium*-type, and *Apium*-type. There was also some standing water since *Batrachium*-type *Ranunculus* was found, and *Alisma* (water plantain) was present in the uppermost sample. Framboids were present at low level and any standing water was probably too shallow to maintain reducing conditions sufficient for large quantities of iron sulphide to form.

The radiocarbon determination at 33cm had a range of 310 years which might suggest that sediment in this sample accumulated more slowly. Figure 37 also indicates slow accumulation and the sediment growth index between 57cm and 33cm was 20. There is evidence of mineral inwash into the system so the lowered growth rate probably means that less organic debris was being deposited within the channel. Certainly, with increased wetness, a higher peat growth would be expected because of reduced decomposition in waterlogged conditions. However, it must be remembered that these estimates are very crude and the deposit between 57cm and 33cm includes much of the accumulation which occurred at the top of the previous zone (SC5). To obtain more accurate estimates of sediment growth rates, a higher dating resolution would be needed.

The boundary between Zones SC5 and SC6 was placed where there was a marked decline in all the major woody taxa, small trees and shrubs, although *Salix* rose slightly and *Hedera*, *Prunus*, and *Ilex* (holly) were recorded. The decline in trees and shrubs was mirrored by a significant rise in herbaceous plants of both wet areas and drier ground. Poaceae, *Plantago lanceolata* and many ruderals and grassland/pasture weeds were more frequent and abundant. Both microscopic charcoal concentrations and cereal-type pollen abundance increased and it is obvious that people were modifying the catchment's vegetation on a much larger scale than before. It is also important to note that unlike in Zone SC5, the impact of woody taxa was unselective and suggests the creation of much larger clearings in both the local and extra-local woodland.

The apparent increase in wetness and the change in lithology to a brown clay, containing fine sand and less abundant wood, suggests that much less fen debris and litter was contributing to the sediment and that the removal of trees was causing run-off into the channel. The channel was certainly still wet but iron pyrite framboids were present at low level. The fall in fungal spores (other than *Glomus*-type) also indicates a lessening of infected leaves falling into the site and might suggest an opening of the canopy at the pollen site.

Zone SC7

The relatively high palynomorph concentrations, levels of unidentifiable grains, and *Glomus*-type, and a progressive drop in organic content suggest that inorganic material (probably eroding soil) was persistently being deposited into the channel. Framboids were only recorded at one level and yet the system continued to be wet enough to support increased growths of aquatic and emergents and other wetland plants, particularly Cyperaceae, *Apium*-type, and *Sparganium*-type, and notably *Alisma*. The banks, or possibly the surface, of the channel were also colonised by tall herbs and small prostrate wetland plants such as *Chrysosplenium* and *Hydrocotyle* (pennywort). *Spirogyra*, other algae, and *Rivularia* also indicate that standing water was available, at least seasonally.

The radiocarbon determination at 17cm had a range of 380 years, which might suggest a low rate of accumulation in that sample of sediment, but between 33cm and 17cm the sediment growth index was 30, the same value as for the basal sediments. Nevertheless, accumulation is very slow when compared with sedimentation in the middle of the sequence, and this is probably indicates that less organic debris was incorporated into the channel deposits.

The zone boundary between Zones SC6 and SC7 was placed where there was another, more marked, decline in all the woody taxa and abundant evidence for extensive exploitation of the landscape. Much of the fen carr was cleared and no wood was found in the sediment. Trees growing on the drier soils were also adversely affected: *Ulmus*, *Fraxinus*, and *Tilia* were reduced to low levels and the reduction in *Hedera* suggests that trees supporting it were actually being removed. Some shrubs were growing in the vicinity of the channel, notably *Prunus, Sambucus*, *Populus* (aspen), and *Rhamnus* (purging buckthorn), while *Salix* actually flourished in the better illumination created by clearing.

The removal of trees probably resulted in extensive run-off and increasing wetness and this, coupled with higher light intensities, resulted in a flourishing of the aquatics and emergents of the fen carr. Framboids were found in only one sample and it is possible that the sediment was subject to seasonal oxidation. The influx of soil into the channel is evident in the progressively falling values for organic content of the sediment and the good representation of *Glomus*-type. There was a marked increase in Poaceae, *Plantago lanceolata* and other grassland herbs and ruderals. *Pteridium* seems either to have expanded out from the woodland edge, or the removal of trees may have allowed better dissemination of its spores. There was a continuous curve for cereal-type pollen, eggs of intestinal parasites (*Ascaris* and *Trichuris*) were found, and microscopic charcoal levels reached very high concentrations, although gradually declining towards the top of the zone.

There is little doubt that people were engaged in both animal husbandry and arable farming and, with tree and shrub pollen at about 50% throughout the zone, it is reasonable to assume that there were extensive clearings created in the environs of the channel.

Discussion

Figures 39a and b show that both the oldest and youngest estimates for each radiocarbon determination follow the same pattern in the depth/time curve. This curve gives an indication of the rate of sediment accumulation through the sequence, and the regression lines show that accretion was non-linear. The calculation of a sediment growth index is shown graphically in Fig. 39d. This is a very crude measure and its accuracy depends on the number of radiocarbon measurements in the sequence as well as the resolution of the radiocarbon determination itself. However, it is useful for giving a broad picture of variability in sedimentation rate and, in some instances, for highlighting possible hiatuses in the sequence.

A significant rise in sediment growth index could be the result of increased wetness with ensuing inhibition of decomposition and accumulation of organic matter. Obviously, the volume of organic litter and debris entering the system would also be critical. A marked drop in sediment growth index could be caused by several (or even combinations of) factors. If the channel dried out periodically so that aeration and redox potential were raised, high humification could result in marked retardation of sediment growth. If this were the case, lowered levels of both organic content and iron pyrite framboids might be expected. The organic matrix might become progressively removed by decomposer organisms, and iron pyrites by oxidation (Wiltshire 1995). Humification can also result in increased density of palynomorphs so that concentration values rise; pollen, spores, and fungal and insect remains are among the last of peat constituents to decompose, especially under conditions of low pH (Moore *et al.* 1991). Another reason for an apparent drop in sedimentation could be scouring, and loss of material by active water flow, especially in a channel which receives water of high energy from time to time. Pollen curves are often useful in detecting such hiatuses with massive changes in pollen spectra occurring over short distances within sediment sequences. These effects are also seen where deposits have been removed by people or animals. These factors must be kept in mind when considering the reasons for the non-linearity of sediment accumulation in the palaeochannel.

Figures 39a, b and d indicate that accumulation was moderately high between 149cm and 137cm, with a growth index of 30 (1cm = 36 years), but dropped to a value of seven between 137cm and 117cm. The 20cm of sediment separating the samples would represent more than 2600 years. Even with very high levels of humification, it is unlikely that this relatively small depth of sediment would represent such a long period of time. It is probable that some event such as channel flow removed sediment. Between 117cm and 97cm, the index rose to 60 (1cm = 17 years), and to 80 between 97cm and 73cm (1cm = 13 years). Accumulation rates between 73cm and 57cm were even higher, with a value of 90 (1cm = 11 years), but dropped to 20 between 57cm and 33cm (1cm = 51 years). Whether this represents marked humification of peat somewhere between these depths, or whether there has been some loss of sediment could not be resolved in the project's analysis programme. Rates at the top of the sequence between 33cm and 17cm were about the same as in the basal deposits, with an index of 30 (1cm = 31 years).

Although the Snail channel sequence covers more than six millennia of vegetation history, the 60cm between 117cm and 57cm probably span a period of less than 1000 years. This attests to the highly variable nature of the sedimentary environment in the channel, where shifts in hydrology might have caused truncation and changes in humification rates. Where sedimentation is rapid, a sample will contain a higher complement of contemporary material and much better resolution is obtained in both dating and the palynological record. It is interesting that Fig. 39c and d show that radiocarbon determination ranges were narrower where sedimentation was fastest. This is probably due to lack of mixing of older and younger sediment in the sample taken for dating.

Descriptions and interpretation of the sedimentary environment were based largely on the palynological record, and it is of considerable interest that the boundaries of many of the local pollen assemblage zones coincided with changes in lithology. Variation in the sediment matrix probably indicates changes in the sedimentary processes, and this must be borne in mind in interpretation of the pollen spectra since lithological change could affect taphonomic processes, and thus the palynological record itself.

The sediments of the Snail channel provide a record (albeit interrupted) of sedimentation, vegetation history and human impact on the landscape from early Mesolithic to Beaker/Early Bronze Age times. This spans several millennia and the nature of the pollen site inevitably changed through time *via* the agencies of natural ecological succession and, superimposed upon this, perturbations caused by climatic and hydrological events, wild animals, and the activities of people.

Throughout its history the site has varied from being open, with a large pollen catchment, to being closed by dense woodland, where inputs from the regional pollen rain would have been screened and prevented from entering the record. This means that the size of the pollen catchment has expanded and contracted through time. A predominantly regional record gradually gave way to a very local one as the Flandrian vegetation approached climax, and then back to a more regional one as the woodland was opened up (see Jacobsen and Bradshaw 1980, Brown 1997). Once the climax community had developed fully, fluctuations in pollen catchment size varied according to perturbation from the agencies mentioned above. Inevitably, palaeochannels are classed as being small sites and, when wooded, about 80% of the pollen could be expected to be of local origin (Brown 1997). Much of the history recorded by the Snail palaeochannel is, therefore, of a very local nature.

It is important to note that episodes of truncation, variations in sedimentation rate, and marked changes in humification point to an unstable depositional environment within the channel during the period of sediment accumulation. This is reflected in the variability of the sediments themselves and by the manner in which some horizons lie unconformably over others. Missing sediment represents gaps in the sedimentological and botanical record, and it is difficult to resolve whether these were due to increased water flow because of increasing climatic wetness, human influence, or a combination of both.

The basal grey clays had such low organic content that radiocarbon estimations were not possible, and the first determination was obtained from the highly organic sediment in Zone SC2 between 149cm and 150cm. A determination of 8020–7590 cal. BC (OxA-6364) confirms that the sediments in Zone SC1 must have started accumulating in the early post-glacial (in the early Pre-Boreal period). During this time, the landscape around the Snail channel was dominated by open, herb-rich grassland with *Betula*, *Pinus* and *Salix* and some *Corylus* and *Ulmus*. There was open, stagnant water in the channel and it was becoming choked with algae, water weeds, emergent plants, and tall herb communities fringing the banks. A wet fen meadow must have extended away from the channel and the local grassland contained plants that were relicts of the end of the Devensian Late Glacial. Later, *Pinus* and *Corylus* began to encroach into the *Betula* stands, and *Quercus* became established in the catchment.

Unfortunately, it is impossible to place these deposits within a precise temporal framework, but they must have accumulated before the time range quoted above. They appear to cover the beginning of the replacement of the Pre-Boreal *Betula* woodland by *Pinus* and *Corylus*. The nearest site of archaeological significance to the Snail channel is at Peacock's Farm, Shippea Hill, about 10km to the north-east, and analysis of deposits dated from 8260–7900 cal. BC (CAR-1102) showed a landscape which was already heavily wooded at that time. It was dominated by *Corylus* and *Pinus* with *Quercus*, *Ulmus* and *Salix*, with herb values of < 20% (Smith *et al.* 1989, 214–19 and fig. 9). Since Zone SC1 at the Snail channel reflects a much more open situation than that recorded at Shippea Hill between 8260–7900 cal. BC, *i.e.* about 8080 BC, it might be surmised that its sediments accumulated some time even before this, *i.e.* before the establishment of dense woodland.

The presence of microscopic charcoal in every sample of Zone SC1 suggests either that natural fires were frequent, which is unlikely (see Bennett *et al.* 1990), or that early Mesolithic people were exploiting the local terrain on a regular basis. The low concentrations of charcoal indicate that either people did not use the area around the pollen site very extensively, or that their activities were centred some distance away. It must be remembered that the open nature of the channel would allow the regional vegetation and microscopic charcoal to be recorded as well as the very local, so fires of landscape proportions would be likely to leave a large signal in the sediment.

The marked changes in the pollen spectra at the boundary between Zones SC1 and SC2 indicate that there has been a loss of some information in the analysis. This may be due to very high levels of humification so that sampling has been too crude for the definition of detail, but it is equally possible that some sediment was lost through active water flow.

Zone SC2 presents a very different environment at the site from that recorded in SC1. Between 8020–7590 cal. BC (OxA-6364: at 149cm) and 7540–7200 cal. BC (OxA 6363: at 137cm), *Betula* had given way to dense *Corylus* and *Pinus* woodland characteristic of the Boreal period (*sensu* Godwin 1940b; 1975a) when the climate is considered to have been warm and dry. Zone SC2 shows that the channel itself must have had enough standing water, at least seasonally, to allow iron pyrite framboids to form and to support aquatic algae. However, the high degree of humification of the peat, moderately low sediment growth, and the very poor representation of wet land taxa support the contention that conditions were relatively dry locally.

The virtual absence of herbs other than ferns, some wetland indicators, and a few dryland taxa suggest that the site was heavily shaded. The channel and its immediate environs were probably enclosed by *Corylus, Salix*, and some *Betula*, while a little distance away, *Pinus* woods were being invaded by *Ulmus* and *Quercus* and occasional *Tilia*. *Alnus* had also established somewhere in the landscape but was certainly not growing in the near vicinity.

Re-evaluation of pollen diagrams produced from East Anglia has shown, in broad terms, that the region's early post-glacial woodland was very variable in composition (Bennett *et al.* 1990) as were the arrival times and subsequent performances of species (Smith and Pilcher 1973; Huntley and Birks 1983). It would be unproductive, therefore, to attempt an extensive cross-correlation of the Snail channel sequence with those at other sites. However, Zone SC2 does cover the period in which Smith *et al.* (1989) claim the beginning of a pronounced woodland clearance at the Shippea Hill site, starting *c.*

7440–7040 cal. BC (CAR-1100). The clearance thus lasted for about 1500 years. The Shippea Hill sediments were stratified, one band being very rich in microscopic charcoal, and Smith and his colleagues (1989) suggested that the clearance was both initiated and maintained by fire. They outlined the palynological evidence for dry conditions at this time, but could not explain why *Corylus* was cleared first in spite of the greater inflammability and sensitivity to fire of *Pinus*.

At the Snail channel, there is certainly no evidence of large-scale fire and long-term, extensive clearance of the woodland, and if there had been a significant regional perturbation, some larger signal might be expected in the pollen diagram. Only very small amounts of microscopic charcoal were recorded in Zone SC2 and the site seems to have been overwhelmed by *Salix* swamp, with *Corylus* spreading out onto drier soils of the Boreal *Pinus* woods. The channel was densely shaded with, perhaps, just a few gaps allowing enough light to allow some wetland plants and occasional herbs to grow. The closing of the site by trees would have resulted in the creation of a smaller catchment so that the regional vegetation and charcoal records might have been less represented than before. It would be imprudent, therefore, to assume that a densely wooded site like the Snail channel would necessarily register signals over a distance of 10km. Relatively little experimental work has been done on microcharcoal dispersal, and few data on signal-to-noise ratios are available. At present it is impossible to predict accurately the size, intensity, or duration of a source fire from the microcharcoal record.

There was certainly a progressive decline in *Pinus* and a temporary fall in *Corylus* at the Snail channel at around the date quoted by Smith *et al.* (1989), but this may well have been in response to competition from *Ulmus* and *Quercus*. Brown (1997) considers that the scale of clearance at Shippea Hill indicates a fall in tree pollen to be due to tree throw and subsequent burning by opportunistic occupation of the natural clearing. If this were the case, the site must have been very favoured and exploited by many generations of Mesolithic people for it to be kept open for 1500 years. Active clearance of the extra-local *Pinus/Corylus* woods might well have facilitated the establishment of *Ulmus* and *Quercus* into the region, but this cannot be confirmed from the palynological data.

The differences in the lithology and pollen spectra between Zones SC2 and SC3 are even greater than those between SC1 and SC2; as already discussed, this is probably due to a hiatus in sequence. This is unfortunate since a great deal of information on the nature of the landscape and signals of fire in the Mesolithic have been lost. The nature of fires and their role in the ecology of woodland in prehistory is currently a topic of much debate, and there is now a large body of evidence in both upland and lowland Britain for periods of extensive and prolonged burning in the Mesolithic period. Extensive fires seem to be associated with the hunter-gatherer economy and there is much less evidence for the use of fire in the Neolithic (Simmons and Innes 1981, 1987; Edwards 1988; Edwards and McIntosh 1988; Bennett *et al.* 1990; Lewis *et al.* 1992; Wiltshire and Edwards 1993). There appears to be a Neolithic 'charcoal decline' in many pollen diagrams. It is of considerable interest, therefore, that sediments of Mesolithic age at the Snail Channel have evidence for only very small-scale fires.

In Zone SC3, *Ulmus* appears to have been about as abundant as before the hiatus, but the marked reduction in *Corylus*, *Pinus* and *Salix*, and the expansion of *Alnus*, *Quercus*, *Tilia* and *Hedera* along with the introduction and expansion of *Fraxinus*, with *Cornus sanguinea*-type, and *Prunus* shows that the character of the woodland had changed very greatly by the time sediment accumulation recommenced at the site.

Although *Alnus* was recorded in SC2 it had certainly not become abundant in the landscape, but at the beginning of SC3 it was well established. The spread of this tree was diachronous in Britain but it appears to have become important at Shippea Hill after 6070–5730 cal. BC (CAR-1098), *i.e.* at *c.* 5900 BC. Its rise was synchronous with that of *Tilia* but considerably earlier than that of *Fraxinus* (Smith *et al.* 1989). Since Shippea Hill is so close to the Snail Channel site, one might expect the woodland succession to follow a similar pattern. The loss of sediment between SC2 and SC3 seems to be confirmed by the fact that both *Tilia* and *Fraxinus* were well established just above the zone boundary.

Sediment growth between the radiocarbon dated samples at 117cm and 97cm was nearly twice as rapid as in Zone SC2 (1cm = 17 years). There was some evidence for rising water table in the channel and whether this was due to the climatic wetness (generally considered to be the case in the Atlantic period) or whether disturbance of the woodland caused greater surface run-off into the channel is difficult to ascertain. Certainly, the channel itself was dominated by alder carr, possibly with *Betula*, *Fraxinus* and *Corylus*. The relatively rapid peat growth is likely to be the result of large amounts of leaf litter and debris falling from *in situ* carr vegetation into waterlogged, anaerobic sediment, and the large numbers of fungal spores are likely to have been derived from phylloplane populations from the same source (Anderson and MacFadyen 1976).

Tilia-dominated woodland with *Quercus* occupied the drier local soils, and occasional *Pinus* was growing further away in the catchment. The comparatively low percentages of *Tilia* when compared with *Alnus* and *Corylus* are no reflection of its status in the woodland. *Tilia* is insect-pollinated and its pollen is poorly dispersed. Percentages of about 20% or more indicate that the tree was very important locally and might even have been more abundant than *Alnus*. It is very likely that *Tilia* was actually the most abundant tree in the landscape around Fordham in the late Mesolithic, as it was elsewhere in southern and eastern Britain (Godwin 1975b; Birks *et al.* 1975; Greig 1982). It was certainly very abundant at Shippea Hill (Smith *et al.* 1989).

There was some opening of the canopy during the Late Mesolithic and the woodland became more diverse. The increased frequency of grasses, other open-habitat herbs, and microscopic charcoal suggests that the dense carr was being disturbed from time to time. Small areas might have been kept clear by animal trampling and browsing, and *Ascaris* worm eggs attest to the deposition of animal or human faeces into the channel itself. The increased and consistent presence of *Glomus*-type vesicles indicate that soil was eroding into the channel, and it is certainly possible that this occurred through the action of animals or people.

It is difficult to know whether the activities of Mesolithic communities had any substantial influence on the decline of *Pinus*, *Corylus* and *Salix* and the reciprocal response of *Alnus*, *Tilia*, *Quercus* and *Fraxinus*. It is often assumed that they had little impact on the dense Boreal and Atlantic woodlands, the pattern of succession determined instead by climatic and edaphic factors and by interspecific competition. It is certainly possible, however, that Mesolithic groups influenced the course of succession at Shippea Hill and other sites (Keef *et al.* 1965; Wiltshire and Edwards 1993; Lewis *et al.* 1992). For example, removal of *Pinus* by burning might facilitate a more rapid colonization of *Quercus*, *Alnus* and *Tilia*. Smith *et al.* (1989) also point out that hazel rods may have been exploited for construction purposes and coppicing could have had a considerable impact, not only on the pollen record but also on the relative performance of the shrub itself. Both *Corylus* and *Salix* would be useful and there is no reason to suppose that Mesolithic people would have ignored such valuable resources. Heavy exploitation of these shrubs in the environs of the channel might have given trees such as *Alnus* a competitive advantage.

Sediment growth rate between the dated samples at 97cm (Zone SC3) and 73cm (Zone SC4) was rapid (1cm = 11 years) so that much of Zone SC4 must have represented a substantial and rapid accumulation of organic debris. Organic content (Fig. 39d) reached higher values than in any other part of the sequence, and the sample at 81cm consisted totally of humified wood. The very marked fall (almost to extinction) of iron pyrite framboids may indicate that the very large amount of organic debris lifted the sediment surface above the water table, at least periodically. This would inhibit iron and sulphate reducing bacteria so that framboids would not be formed, and any seasonally-produced ones could also oxidise during drier conditions. The very low levels of *Glomus*-type vesicles also suggest that less soil was eroding into the channel so that the lack of detrital iron might have been another limiting factor to framboid formation.

At the beginning of the zone, before the gap at 81cm, the site was still dominated by dense alder carr, and very few herbs were able to grow in the dense shade. However, above the gap in the record, there seems to have been some impact on the woodland canopy in and around the channel. Just before the dated sample at 57cm (3990–3710 cal. BC; OxA-6359), it would seem that *Alnus*, *Fraxinus*, *Tilia*, *Pinus*, *Salix* and *Ulmus* were being either cut or removed while *Corylus*, *Quercus* and (marginally) *Betula* seem to have been favoured. It must be remembered that their increase might be apparent rather than real because of the statistical representation of the data. Nevertheless, *Hedera* and some open-habitat herbs were better represented, as well as wetland herbs. The increased microscopic charcoal, and decreased organic content and fungal spores, point further to human activity within the environs of the site. With the clearing of the *in situ* trees and shrubs, less organic debris (including leaves and their phylloplane microflora) was available to the sediment.

The zone boundary is drawn where *Ulmus* was in decline, and this might be the horizon of the 'elm decline' which is well documented in British pollen diagrams. *Ulmus* was never well represented at the Snail channel and its percentages fluctuated throughout the sequence so that identification of the Neolithic decline is difficult. Indeed, *Ulmus* does not seem to have been abundant in East Anglia and pronounced declines are absent from many pollen diagrams from the region.

It is possible that Neolithic people were responsible for the woodland disturbance seen just above the gap at 81cm. Indeed, this would give an interpolated uncalibrated determination of 5285 BP which is within the average of between 5300 BP and 5100 BP (Smith and Pilcher 1973), but the elm decline may not be a particularly significant chronostratigraphic marker in East Anglia (see Waller 1994a). Even where declines are well defined, as at Hockham Mere (Bennett 1983), there are problems in identifying the one which marks the impact of Neolithic activity. The pattern of elm fluctuation in the Snail channel diagram is certainly consistent with the pattern of declines, partial recoveries, and final demise typical of early outbreaks of Dutch Elm Disease, and people may well have played a role in its spread. There was certainly evidence of greater human impact on the local landscape and channel vegetation in the upper part of SC4, and the presence of intestinal parasitic worm eggs confirms that faecal matter was getting into the sediment.

Zone SC5 is characterised by an intensification of woodland disturbance, and *Corylus* and *Alnus* seem to have been most affected, falling to much lower levels at between 3990–3710 cal. BC (OxA-6359). The lowering of organic content (which was progressive above 53cm) suggests that much less organic litter and/or increasing amounts of soil were now being incorporated into the sediment. This might mean that trees were being removed from the channel itself and from its banks. The environs of the channel still appear to have been densely wooded and the impact of people on *Corylus* and *Alnus* seems to have allowed *Tilia*, *Fraxinus*, *Ulmus*, *Hedera* and a range of light-requiring shrubs to expand. However, the expansion might be more apparent than real. Increased pollen production can be a response to the removal of dense shade-producers, and openings allow some trees to flower more prolifically when given better illumination, making them better represented in the pollen record (Aaby 1986, 1988). The clearings might, therefore, have been much more extensive than the tree pollen curves would suggest. Certainly, the herbaceous flora was well represented with wetland plants, Poaceae, ruderals, and a wide range of other dry land and wetland herbs increasing as the light was able to penetrate the woodland floor. Furthermore, many of the ferns so characteristic of damp woodland were not represented. In the latter part of the zone, *Corylus* and *Alnus* recovered from the earlier onslaught and seem to have increased at the expense of *Quercus*, *Ulmus*, *Betula*, *Fraxinus* and *Tilia* although there was still enough light for some shrubs and dry land herbs to flower, including Poaceae, *Plantago lanceolata*, and other ruderals.

The presence of cereal-type pollen before 3990–3710 BC means that arable agriculture was being practised in the extensively wooded landscape. It also means that human communities exploiting the terrain around the channel included Neolithic people, even if late Mesolithic hunter-gatherers were still living in the area. It seems that cereals were being grown in woodland clearings (Goransson 1986 and 1987; Wiltshire and Edwards 1993), and some method of rotation might even have been carried out as soil fertility gradually waned and recovered after a period of abandonment. The extent and longevity of such clearings would be difficult to assess. At least four models of forest farming have been proposed from palynological studies (*cf.* Edwards 1993): landnam, leaf foddering, expansion-regression and forest-utilisation. The presence of *Ascaris* eggs in three samples also attests to the continued input of faeces to the system, and these might have been derived from domestic stock browsing or drinking from the channel.

The increase in microscopic charcoal implies that fire was employed in the creation of gaps in the woodland, and it is highly likely that dead wood and surface litter would have been removed by burning. However, substantial amounts of microcharcoal might also have been derived from domestic fires (see Bennett *et al.* 1990). It is certainly clear that the palynomorph spectra in Zone SC5 reflect the exploitation of the landscape by Neolithic people, and that farming was established in the environs of the site before 3990–3710 BC.

The determination of 2780–2470 cal. BC (OxA-6358) at 33cm shows that Zone SC6 covers a period when the site was being extensively cleared by Late Neolithic groups supported by agriculture. The pollen diagrams record a sustained opening up of the landscape, with unselective reduction of the woodland: most trees and shrubs were being removed, cut, or exploited in some way. *Salix* and *Betula* were the exceptions and they benefited from the removal of other taxa. With the progressive decline in the organic content of the sediment, trees were probably being removed from the channel as well as away from its banks, and local soils were eroding into the sediment. The openness of the channel is also evidenced by the increase in aquatics and wetland plants, and dryland herbs increased with the expanding grassland. The pollen spectra show that herb-rich grassland and open, disturbed soils were becoming more widespread, and cereal production was intensified.

By 2320–1940 cal. BC (OxA-6357) it would seem that Late Neolithic/Early Bronze Age people were living very close to the site and had intensified the processes already established in the Neolithic. The large increase in abundance of microscopic charcoal, relatively high representation of cereal-type pollen in every sample, and the presence of both *Ascaris* and *Trichuris* eggs suggest that the area was being extensively settled by larger numbers of people. Woodland resources were being used more intensively than ever before and all trees were affected, particularly *Corylus*, *Quercus* and *Fraxinus*. *Ulmus* and *Tilia* were also badly affected but whereas *Ulmus* might have declined because of increasing intensity and frequency of disease, *Tilia* appears to have succumbed to direct human impact. The increase in wetland plants implies high water table within the channel, at least seasonally, but there is no overwhelming evidence for increasing paludification which has been explained as being the cause of the decline of *Tilia* in the Fens and elsewhere in southern England (Waller 1994b).

Although there was a large impact on the woodland, it must be remembered that pollen of woody taxa still accounted for nearly 50% of the total sum, and trees and shrubs were very much a feature of the landscape. Prehistoric people must have had a very good knowledge of the potential of wild plant and animal resources and it would seem that they were exploiting these very effectively around the Snail channel. The channel and woodland edges and glades would have been very productive for wildlife and for people. A partially open landscape offers a variety of resources unavailable in dense woodland, and the creation of glades and gaps results in a much enhanced biodiversity and an enrichment of both animal and plant resources.

Herb-rich grassland was more extensive than at any time since the early Flandrian and the range of taxa indicate that a wide range of microhabitats and soils were available. Dry, acidic soils are indicated by the expansion of *Pteridium* and the presence of *Calluna*, while more base-rich soils are suggested by many of the herbaceous and shrub taxa shown in the pollen diagrams (*e.g. Rhamnus*, *Helianthemum* (rock-rose), *Urtica* and others). Many of the herbs found are also common in grazed pasture today and it is likely that grassy areas as well as tree foliage were exploited for stock grazing. People living around the Snail channel at 2320–1940 cal. BC and later were living in a rich, diverse system which could provide many of their basic needs and there is ample palynological evidence that these resources were being used.

Conclusions

Palynological analysis of the Snail channel sediments has provided a wealth of information on the environmental setting within which Mesolithic, Neolithic and Early Bronze Age people lived at the site. Sediment accumulation rates seem to have varied considerably throughout the sequence with very rapid growth in the Late Mesolithic and Early Neolithic. Furthermore, although the archaeologically-relevant sediments remain, sections of deposit seem to have been lost, possibly through reactivation of the channel. The sequence has, however, added greatly to what is known about the environmental history of East Anglia. The midpoints of calibrated radiocarbon ranges have been given here for ease of discussion although it is understood that the true date could fall anywhere within the range.

Well before 10,000 years ago, Early Mesolithic hunter-gatherers were living in an open terrain of herb-rich grassland dotted with stands of *Betula, Pinus, Corylus* and *Salix*. *Ulmus* and *Quercus* trees were present but only in very low numbers. Some of the plants which had been important in the landscape in the Late Glacial were still growing as relicts, and they indicate that very open, nutrient-rich soils were present. The channel itself probably offered sources of food which might have been at a premium away from water. Certainly carbohydrate would have been difficult to obtain and this would have been provided by wetland plants. The channel offered a stagnant, or very sluggishly-flowing, source of water and was fringed by emergents and tall herbs. It probably attracted mammals and birds, which could be hunted more easily here than in the open landscape. The only palynological evidence for a possible human activity is microscopic charcoal which was consistently present at low level.

It would seem that some of the sediment is missing for the period between the beginning of the expansion of the Boreal woodland, and its full development. Between about 7800 and 7370 cal. BC, and for some continuing period afterwards, an impenetrable woodland established, which was dominated by *Corylus* and *Pinus* with some *Ulmus*, *Quercus* and *Betula*; the channel itself was dominated by *Salix*. The woodland was so dense that pollen of herbaceous plants was hardly recorded, and the amounts of microscopic charcoal were negligible. However, it was frequently represented and suggests that people were still active in the vicinity. Indeed, there are just hints of small clearings being made but, of course, these could have been generated through natural deaths of trees.

At a later time, which cannot be determined, there was again the loss of a considerable amount of sediment from the sequence. When peat accumulation resumed, it proceeded very rapidly for a period of about 1000 years (*i.e.* before 4670 cal. BC to at least 3850 cal. BC, and possibly beyond) under seemingly stable conditions. The amount of organic matter and the concentrations of fungal spores suggest that very large amounts of litter and debris from *in situ* woodland was at least partly responsible for the fast sedimentation. There were marked differences between the former Boreal woodland and the one that had developed by the time peat growth recommenced. A dense alder carr had grown up on the site but the dominant tree on the drier ground close by seems to have been *Tilia*, although *Corylus* and *Quercus* were also abundant. There is evidence for gaps in the canopy appearing in the channel and in the adjacent woodland; these allowed herbs to flower but, overall, the site remained densely wooded throughout the Late Mesolithic period. People were certainly active in the area and charcoal levels were consistently higher than ever before. The woodland gaps must have been large enough to allow smoke and smuts to get into the sediment, and it is possible that fires were made on the channel banks.

At some time before *c.* 4030 cal. BC, all the woody taxa except *Corylus* and *Quercus* declined. The channel itself was still rapidly accumulating wood-rich peat and it would seem that it was so densely vegetated that other evidence for woodland change is slight, although some light-demanding plants were recorded and charcoal levels rose slightly. It is possible that Neolithic peoples had moved in and had begun to convert areas for agriculture. Cereal growing was being carried out before about 3850 cal. BC and, from the frequency of pollen from light-demanding shrubs and both dry land and wetland herbs, it is evident that clearings were being created. The creation of glades and more extensive woodland edge would have meant the enhancement of diversity, not only of plants but also of animals. Resource availability at the site was being enriched by the removal of some of the dominant trees, allowing light to enter the system. Fires were more intense, and possibly nearer to the pollen site, and it is clear from the organic status of the channel sediments that vegetation was being removed from the channel itself.

This process was much intensified by *c.* 2625 cal. BC, and there was increased use of fire (whether domestic or at landscape scale is difficult to determine) and all trees and shrubs were being exploited. It is also interesting that the demise of *Tilia* seems to have been due to human exploitation, rather than paludification as has been suggested elsewhere in East Anglia and south-east England. Cereal production appears to have been carried out on a greater scale and the channel may have been used as a watering hole for cattle.

By 2130 cal. BC about 50% of the woodland had been cleared (*sensu* Heim 1962) and, although *Quercus*, *Alnus* and *Corylus* were still relatively abundant, most of the other tall trees were very much reduced. Nevertheless, *Salix* was still growing the channel and a range of other shrubs were available for a variety of uses. Cereal-growing was well established and the channel offered a range of wetland plants. Herb-rich grassland and possibly pasture were also developed and the site received very large amounts of charcoal, presumably from some activity being carried out nearby.

It is interesting to note that significant clearances of the woodland at the Snail channel were not achieved until the Late Neolithic/Early Bronze Age. Farming seems to have started in cleared areas within the woodland, and the first cereal-type pollen was found before *c.* 3850 cal. BC. However, a period of over a thousand years elapsed before more intensive agriculture was practised at the site after about 2625 cal. BC.

VIII. Faunal remains

by Rosemary Luff

The overall distribution shows that cattle predominate, including meat-bearing and non-meat-bearing bones (Table 17); however, the distribution of skeletal elements is characterised by a large number of skull fragments.

A minimum of two cattle is represented by the cattle bones, on the basis of the metapodials. In addition, one large metacarpal recovered from the first sondage through the Snail palaeochannel (F.6 *033*: the upper fill of the palaeochannel) belonged to a wild bovid, *Bos primigenius*. Wild cattle have been identified in Early Bronze Age levels at Lowes Farm, near Littleport, Cambridgeshire and in close proximity to this site at County Farm, Mildenhall Fen (Tinsley with Grigson 1981). The radiocarbon determination for organic material extracted from tertiary sediment at 0.17m depth from the top of the uppermost pollen monolith of 2320–1940 cal. BC (*033/487*) indicates a date for the Snail aurochs consistent with these other local examples. The respective features, *125*, *128*, *131*, *140*, *142*, *143* and *144* contained very small amounts of bone. A crab claw from <2235>

Taxa	*NISP*	*%NISP*
Wild cattle	1	<1
Cattle	199	50
OXO*	108	27
Sheep/goat	31	8
SMA*	53	13
Pig	6	2
Horse	1	<1
Dog	1	
Crab	1	
Bird	1	
Red deer	3 antler	
Unidentifiable bone	190	

* Luff's OXO and SMA categories are defined in the faunal remains report for Prickwillow Road (Site 1).

Table 17 Total number of bone fragments recovered from the Snail channel (Site 6)

Context	*Taxa*	*No. of examples*	*Butchery type*	*Bone type*
TP34 *202*	sheep/goat	1	1	tibia
TP36 *304*	cow	1	1	tibia
TP46 *201*	cow	1	2	cervical vertebrae
TP47 *202*	oxo	1	1	tibia
TP60 *202*	sheep/goat	1	1	humerus
TP74 *304*	cow	1	1	femur
F128 *392*	cow	1	1	radius
*F200 *488*	cow	1	1	scapula
F.200 *490*	oxo	1	1	rib

Butchery type 1: knife-cuts/filleting; *butchery type 2*: chop-marks dismemberment
* Pl. VI

Table 18 Butchery data from the Snail Channel and associated settlement remains

201 hints at possible longer-distance contact with coastal resources.

Ten bones, predominantly cow, exhibited butchery marks (Table 18) which appear to have been made by metal tools (see discussion of cut-mark analysis on the Prickwillow Road site report), clearly demonstrated in marks on a cow scapula from the tertiary peaty fills of the Snail channel (Pl. VI). Marks associated with filleting and with carcass preparation for the consumption of flesh were well represented on meat-bearing bones.

IX. Discussion

In studying the Isleham lithics recovered from field-walking for the Fenland Survey, Andy Brown (1996) attempted to define the use of artefacts and the variability of flake selection between sites and/or over time through microwear analysis. Three main conclusions of the study were defined:

i) There was a visibly-changing emphasis on types of actions being carried out from the Late Mesolithic to Bronze Age periods.
ii) The relative representation of actions was defined by the duration of a task, rather than the nature of tasks themselves.
iii) The availability of raw material may have decreased as conditions became wetter. Brown suggested that the appearance of imported black flint in the Late Neolithic assemblage may represent an attempt to overcome difficulties of procurement to some degree, and that it coincided with an increase in the local assemblages of elaborate lithic artefacts made from the distinctive black flint (*e.g.* petit tranchet derivative arrowheads and plano-convex knives: Brown 1996, 209). This trend has been corroborated in the pipeline assemblages from Isleham.

The two principal river systems — the Snail to the west of Isleham and the Lark to the east — were clearly influential in the siting of settlement, ceremonial and activity areas. Hall's distribution maps (1996, fig. 41, 104–5) of Neolithic and Bronze Age sites closely fringing the south-eastern corner of the fen basin show the striking concentration of activity around these two river systems, and that of the River Wissey further north, bounding the southern extent of the Norfolk Wissey embayment (*cf.* Silvester 1991). These rivers would have provided essential fresh water conditions and associated resources in a region that also offered brackish water, fen carr and wooded environments — effectively providing a rich combination of habitats and exploitation zones (Waller 1994a).

The combined results of the pipeline and enhancement lithics survey suggest small-scale Mesolithic activity in the immediate vicinity of the River Snail, overshadowed by a more persistent Early Neolithic presence throughout the survey area. A predominance of narrow flakes, blade cores and flakes from bifacial tool manufacture indicates activities conceivably connected with clearance and management of the bank-side woodland as well as other tasks. The suggestion of such activity occurring at first in small clearings comes from the environmental evidence contained in the Snail's sediments. Pollen and molluscs both demonstrate the prevalence of a largely closed canopy until well into the Neolithic. Without knowing the regenerative speed of the created and natural clearances within the woodland, it is probable that this area of channel junctions saw repeated visits by groups, at least on a seasonal basis. The possibility of more long-term occupation can only be surmised, but its location above the flood limit of the Snail would have certainly been viable. In fact the lithics from the enhancement survey conducted on the slopes of the east bank provide a more varied data set than those seen around the edges of the channel. A picture emerges of a settlement core pitched just proud of the river's reach, nestling in a broad meander at the channel's junction, with numerous task-specific areas occurring on the site's periphery.

The edges of the channel would have been prone to a variety of erosive and submergence effects — a situation seen macroscopically in the section of the evaluation trench where thick, layered deposits of chalky marl slumped into the channel and were overlain from time to time with flood-borne sediment. Micromorphological evidence confirms the pattern and depicts bank-side soils that became steadily more denuded due to large scale clearance upslope, an effect more decisively demonstrated in Wiltshire's palynological analysis. Beginning in the early fourth millennium, the gradual clearance of the deciduous woodland generated the development of hazel and alder carr woodland, at least on the channel's fringes. This prevailed, perhaps intermittently, for about two millennia until a more open landscape was established in the transitional centuries of the Late Neolithic/Early Bronze Age (although Wiltshire emphasizes Edward's research on forest-farming cycles with regard to long-term land-use, as suggested here). Settlement evidence in the form of hut circles, hearths or pits was extremely slim on the pipeline, due in part to its poor survival in this intensively cultivated landscape. However, one feature group — a ghost of a circular eaves-drip gully with Collared Urn associations and a pit and ditch — was found upslope at Site 5 (*c.* 100m east of the channel). In addition, unequivocal evidence of processing activities was evident in the burnt flint assemblages recovered from the channel's edges, particularly the west bank.

Beaker sherds bearing the East Anglian Barbed Wire motif, common in domestic assemblages, were found in association with these pits, suggesting that the margins of the Snail continued as a focus for a variety of activities.

Suggestions of more formal events may come from the presence of ten human bones in the latest sediments infilling the palaeochannel and in relict soils on its banks. The human remains varied in condition, depending on their presence in the soils of the old land surface or in the peaty fills of the channel. At least two individual adults were present at this channel junction (two right femora were recorded: p.51 above). At 2320–1940 cal. BC (OxA-6357), the latest radiocarbon determination for sediments 0.17m below the surface of the infilled channel provides a date range consistent with other Late Neolithic and Early Bronze Age findings of human bone from elsewhere in the peat fen (Healy and Housley 1992, 39). While these remains may testify to chronological and/or regional changes in burial rites, it is just as likely that they signify a need to engage with the dominant life-sustaining marsh upon death, during the same period in which barrows and flat graves represent an archaeologically more conspicuous burial method. Of course, it is only due to the quality of preservation afforded by the waterlogged peats and soils that these 'open' or non-monumental burials remain for investigation at all: they serve to emphasise the point that dead people may have received numerous different funerary treatments at any one time. The association of 'stray' human remains and metalwork has been a focus of active research in the region (Bradley 1991; Downes 1993; Healy 1996; Rowlands 1976). Healy and Housley's study (1992) of in-fen burials and their association with metalwork and other burial accoutrements relates the contemporary occurrence of alternative burial arrangements and connected rituals in regions dominated by water and richly-resourced marshland (Bradley 1991; Pryor 2001).

The presence of human remains in an area dominated by contemporary activities demanding the use of burnt flint is also of interest. Large quantities of burnt flint were present at the water's edge, either carried there from the settlements situated upslope from the river's flood zone and/or from use in the immediate vicinity, evident in the four burnt flint-packed west bank pits. Burnt flint, or pot-boiler, sites are common in the south-eastern fen (Healy 1984; Silvester 1991; Edmonds *et al.* 1999) where they occasionally survive in mounded form in a charcoal-rich matrix (Bates and Wiltshire 2000). Recent investigation of mounds at Feltwell Anchor, Norfolk, for the Fenland Management Project revealed the crouched burial of a young female contained in a hollowed-out log coffin beneath one of them (Bates and Wiltshire 2000).

While the investigation found no evidence of burnt mounds at the Snail, it is clear from the pre-strip surveys and fieldwalking data that the collection and storage/dumping of burnt flint took place. Exhibiting a high proportion of struck flint that was later burnt (by contrast to the 0.05% equivalent from the Feltwell Anchor burnt mound: Bates & Wiltshire 2000; Crowson 2004), much of this material probably derived from settlements and knapping/activity areas relatively close at hand. That this was a task-specific zone can be deduced from the relatively low quantity of unburnt struck flint found in direct association with its burnt counterpart in the immediate area of the channel, compared with the dispersed 'hot spots' evident within the settlement area slightly higher up the east bank (especially evident in the enhancement survey fieldwalking data).

Much research has focused on the geographic distribution and function of burnt mounds and pot-boiler sites (*cf.* Barfield and Hodder 1987; Bradley 1978; Briggs 1976; O'Drisceoil 1988; Silvester 1991). In this region, their marked distribution around the south-eastern fen-edge confirms the importance of proximity to water. Certainly, this was important on the margins of the Snail, though it is not clear precisely what tasks or events the heating of stone was directed towards. It is probably best to conclude that there may have been some variety to these: from cooking, cloth-processing or steaming to the production of temper for pottery. With this last suggestion in mind, it is relevant to note that pottery from the southern fenland area is dominated by flint-gritted fabrics — and that this region also features numerous pot-boiler sites. The shattered fine fragments of burnt flint would have been readily available from these sites for use in pottery manufacture (Petersen and Healy 1986, 101). The discernible decrease in flint-tempered pottery from assemblages in the west fens of northern Cambridgeshire is matched by a reduction in pot-boiler sites to near-absence. For example, at Etton causewayed enclosure (Kinnes 1998) and Deeping St Nicholas Barrow 28 (Gdaniec 1994b) the Neolithic and Bronze Age assemblages are dominated by shell-tempered fabrics derived from the fossiliferous shelly Oxford clay, and Williams noted the preponderance of fossil shell tempers in the full suite of prehistoric assemblages at Fengate, Peterborough (Williams 1980, 87).

The small animal bone assemblage bearing cut-marks, and the occurrence of scrapers and knives in burnt-flint-rich contexts suggest that hide and carcass preparation also took place at the river's edge, slightly displaced from the main locus of the settlement higher up the bank. The stakes and post-holes may be the remains of hide stretchers in the small cleared 'bay' sloping down to the river and, to complete the picture, the uneroded pits on the west bank may have been used in another stage of meat/hide preparation. Although the investigated channel was nearly infilled by this time, one or more of the nearby channels would have been active. The likelihood that any such activity took place here on a seasonal basis is supported by the environmental evidence highlighting overbank flooding and periods of standing water. Seasonality is evident in other pot-boiler sites: autumnal debris in a trough at Playden, Sussex, and sporadic flood deposits in a trough at Leckhampton (Bradley 1978, 83). It could be postulated that although the zone of intensive burnt stone-related activity at the Snail would have been available in the summer and autumn, the smaller, dispersed burnt stone 'hot spots' within the settlement core higher up the east bank may have served it during the wetter months. Beaker sherds and a radiocarbon determination of 2350–1945 cal. BC (Beta-77753) from charcoal from one of the pits place this activity in the Late Neolithic/Early Bronze Age, and suggest a 'domestic' environment accompanied by formal deposition of human bone in the accumulating fen deposits in the Snail valley.

6. Epilogue: Questions of Scale

I. Introduction

Fieldwork on the Isleham to Ely water pipeline occurred at the tail end of English Heritage's Fenland Management Project, and benefited from the sampling and excavation strategies devised in that context. It also provided a welcome chance to reconcile the requirements of a developer-led project with concerns that remain central to research in the region. While the window was certainly narrow, the evidence from the Isleham area in particular has added an important dimension to our understanding of the prehistoric occupation and transformation of this small fen. At the same time, it highlighted contrasts at broader scales, most notably in terms of the character and density of prehistoric activity in other settings, particularly on the heavier claylands.

Constraints aside, this opportunity to work at multiple scales has been crucial and provides a basis for further research and comparative analysis. It was also timely; work in the field brought home all too clearly that continued cultivation at current intensities will lead inevitably to the loss of much, if not all, of the evidence that has been sampled here.

II. Landscape patterning

with Christopher Evans

As a consequence of the CAU's sustained application of site sampling procedures, it is now possible to place the pipeline's results within some sense of regional context. For a variety of reasons, it is imperative that we interrogate our data in such a manner. Not least among these is that some prehistoric landscapes have accrued a certain amount of disciplinary 'mythology', making it virtually impossible to appraise them for what they really are without some appropriate statistical measures. With a long and varied research history, Isleham is certainly one such landscape. This exercise can, of course, only be considered a starting point, as the pipeline transect offers such a limited window into the dynamics of the Isleham landscape as a whole. Nevertheless, if the ability to statistically evaluate and compare site densities is held to be meaningful, then it is worth making such an attempt.

Table 18 lays out the gross densities of the project's sites and, by this means, establishes some broad parameters. We are dealing with sites/scatters that have a mean surface register of between 1.7 and 8.4 worked flints per 10m collection unit (37–127.2g of burnt flint) and metre-square test pit-densities of 1.35–7 flints (26g–5.5kg burnt flint). These figures are not at all inconsiderable. In the first instance they can be compared to the assemblage from Fengate's environs: another renowned, long-term, fen-edge prehistoric landscape. There, the CAU has now implemented standard, metre-square sampling procedures on locally preserved swathes of its buried soils at four recent sites (137m^2 in total). The densities recorded are, however, consistently low, with site-means of only 0.1–2.3 flints per metre (0.97 intra-site average) and, in comparison, Isleham's seem substantially higher. Yet, as will become apparent, this does not in fact seem to reflect Isleham's 'highs' so much as Fengate's generally low densities. While surely seeing higher values locally, the key point seems to be that Fengate did not see anything like the same degree of widespread later Neolithic/earlier Bronze Age activity as did Isleham (see Evans 1993 concerning equally low levels in Chatteris area).

Much nearer at hand, none of the worked flint fieldwalking values from the pipeline sites exceed the levels found on the six scatters in the vicinity of Eye Farm,

	FW		*TP/TT*	
Flint (no.)				
Site	*total*	*Mean*	*total*	*Mean*
Site 1	91	3.85 (high = 8)	61	2.54
Site 4	160	6.23 (high = 15)	122	4
Site 5	60	3.54 (high = 8)	23	1.35
Site 6	16	1.7 (high = 4)	524	3.27 (high = 32)
Enhancement		8.4 (high = 42)		7 (high = 32)
Between 4 & 5	163	3.5 (high = 11)	-	-
Burnt flint (wt)				
Site	*total*	*Mean*	*total*	*Mean*
Site 1	15g	-	-	-
Site 4	2163	127.2g (high =440)	934	3.11
Site 5	389	24.3	-	-
Site 6	1.04kg	116g	88.4kg	5.52kg
Between 4 & 5	1.03kg	57.2g	-	-
Enhancement		37g (high = 1180)	-	26g (high = 402g)

Table 19 Site densities for worked flint and burnt flint

Soham (12–33 flints per 10m unit: Edmonds *et al*. 1999). Investigated during the Fenland Management Project (FMP), these were located on and around a sandy loam (on Greensand) peninsula that juts into the peat fens. It included the vast 8–10ha complex known as Soham 8/9. In the main, this material was of Bronze Age attribution, though it also included earlier, Mesolithic/Neolithic components. With a range of 0–66 pieces per 10m collection unit, and with a mean of 12 pieces throughout, even this figure is higher than any of the mean fieldwalking densities for the Isleham sites. Nevertheless, the problem which that site's analysis posed was where to establish a threshold level at which sub-site core zones 'broke out' for identification. Eventually a figure of 30 or more pieces per unit had to be adopted, which (when appropriately factored) roughly corresponds to that employed by David Hall during the Fenland Survey to define fieldwalking lithic scatters at Isleham (Hall 1996, 82). This, of course, is an enormously high 'bar' by which to set site-level densities. Essentially a threshold of only analytical convenience, the necessity of its application itself reflects upon the semi-continuous nature of the lithic distributions within the Soham/Isleham area.

One further facet of the Soham data — its burnt flint densities — is also relevant here. Aside from a site-central high-value swathe, four other distinct concentrations were identified during the fieldwork. Occurring over 2000–2800m^2, each had mean values greater than 1kg per 10m unit and probably represent ploughed-out 'pot-boiler' mounds.

The Isleham data may also provide some kind of 'domestic baseline' by which to evaluate the intensity of usage of the region's monuments. The Great Wilbraham causewayed enclosure is the most obvious example. The subject of trial excavations during 1975–76, variously directed by David Clarke, John Alexander and Ian Kinnes (see Evans *et al*. 2006), Wilbraham was held to have very high artefact densities (and, indeed, in comparison to the Upper Delphs, Haddenham enclosure it does: *ibid*.; Evans and Hodder 2006). That said, the mean interior surface densities of 9.7 worked flints per 10m (0–42 range) and 9.1 per metre square are slightly higher but broadly comparable with Isleham, suggesting that the enclosure also witnessed activities commensurate with occupation, and perhaps with gatherings.

The highest density of worked flint yet encountered by the CAU was at Honey Hill, Ramsey (Edmonds *et al*. 1999). While at first seeming an unlikely locale for such a site, being on a small sand and gravel rise at the end of a peat fen (on clay-flanked promontory), its situation is, in some respects, reminiscent of the main Soham complex. It was also investigated as part of the Fenland Management Project. While no features whatsoever were found in association with this 1.2ha Late Mesolithic/earlier Neolithic site, its surface densities were extraordinary: 0–253 worked flints per 10m fieldwalking unit (81 mean density) and 0–96 pieces per metre test pit (27 mean; unsieved only, otherwise 11–198 per metre with a mean of 87). Probably seeing seasonal/periodic *en masse* occupation (including much flintworking), entirely unlike the Isleham sites, this place would certainly have been among the few prime/'niche' locales within the immediate landscape. It would, effectively, have been 'enclosed' and restricted by the surrounding contemporary marshes. In an otherwise fairly 'empty' landscape, it was *the* place to return to; occupation in all likelihood was tied closely to the procurement of stone (Edmonds *et al*. 1999) and the resultant high build-up of lithics is without the edge-definition problems that beset the Isleham/Soham fieldwork.

Much has been made of the distinctions visible between the prehistoric archaeologies of the south-eastern and south-western fen-edges, the former seeing much more extensive occupation spreads (and especially 'pot-boiler' mounds), and the latter having a higher frequency of monuments (and, now, a Bronze Age field system). Part of the known significance of the southern, larger Isleham-area 'edge' has been that it incorporates both 'monuments' (particularly barrow groups) and extensive domestic scatters. In this regard, recent fieldwork along the lower reaches of the River Great Ouse (and the adjacent portions of its fen-edge) goes some way to re-address this picture, as we now know that, at least in part, it is a product of the greater degree of alluviation and, otherwise, the later peat horizons that extensively mask much of the south-western terraces. With this degree of cover, the only effective way of prospecting for early sites in-depth (short of continuous area-stripping) is through large-scale test pit sampling programmes, augmented by trial trenching. Recent work has directly adapted and extended techniques that were first developed in the course of the Haddenham Project. At Barleycroft/Over, straddling both sides of the Ouse just above Earith (and immediately south-west of the Haddenham research area), many hundreds of test pit sampling points have now been dug to this end, with volumetric samples of *c*. 90 litres (approximately a metre-square's capacity) being processed from the buried soil horizons from each (Evans and Knight 2000). These techniques have proved highly successful in the identification of Neolithic/earlier Bronze Age 'open' scatter sites, a number of which are accompanied by small pit clusters (buried burnt flint mounds have also been thus detected: Evans and Knight 2000; see also Garrow 2006). Although most have localised/core high-values in excess of 10–20 flints per test pit, both at Haddenham and Barleycroft/Over, site scatters 'break-out' at a level of 4/5 pieces per 'metre' (Evans and Hodder 2006, 213, 227–8, figs 4.8 and 4.14, table 4.11). In other words, these are levels comparable with, if not somewhat greater than, those exhibited by the Isleham sites.

Two other pressing factors need to be borne in mind when trying to comprehend lithic scatter densities, aside from basic problems of repeat, same-site/-locale usage (*e.g*. palimpsest activity) and differential masking (primarily, whether buried soil strata survives). The first relates to whether sites (or parts of sites) were 'tidied up' and closed. This is particularly pertinent for earlier Neolithic pit clusters, where it is clear that 'small-midden' occupation deposits were being backfilled into their 'hallmark' pit features upon the cessation of their episodic use (Evans *et al*. 1999; Garrow *et al*. 2006; Garrow 2006). The other factor is the effective 'erasure' or eradication of scatters in prehistory itself. This would have been incurred by the collection of lithics for burnt flint production, especially during the Bronze Age. Discussed at length elsewhere in the context of the Eye Hill Farm, Soham fieldwork (Edmonds *et al*. 1999, 69), these procurement activities — arguably amounting to a pragmatic pillaging of earlier scatters (and much contemporary flint of that time may, after use, have also been thus reduced through burning) — must have had an enormous impact on the register and even survival of sites, at least within densely utilised landscapes where earlier scatters could themselves represent a ready flint resource. In certain areas, then, histories of collection may be far longer and more varied than we have hitherto supposed — a source of 'bias', certainly, but also a feature of the locally specific ways in which places were occupied and re-used over time.

Overall, the window created by the pipeline confirmed all too vividly that drainage and deep ploughing continue to have a major impact on soil sequences and archaeological contexts. Indeed, conditions are noticeably worse at the time of writing than they were only twenty years previously when the area was sampled by the Fenland Survey. In some areas this process is likely to have a long history, and it is perhaps telling that a significant majority of the later, historic, features encountered along the transect were directly related to processes of land division, agriculture and drainage. In most instances, prehistoric archaeology took the form of worked stone in ploughsoils with a maximum depth of *c.* 20–30cm. More often than not, these scatters constitute the sole archaeological resource; where they survive at all, buried soils and cut features are frequently truncated or all but obliterated. Only where deposits ran to greater depths (*e.g.* into deeper pits, natural hollows or palaeochannels), was material recovered more or less *in situ*. Even then, it was not uncommon to find that later prehistoric flintwork, pottery or bone survived as residual material in later (*e.g.* Iron Age or medieval) pits and ditches.

Conditions do, however, vary. On the sand and chalk of Isleham, for example, it is clear that variability in the density and distribution of surface material is in part a function of undulations in the underlying geology. Apparent 'discrete' scatters are often elements of larger and more varied accumulations, brought to the surface only where the cover is thin and the plough has cut close to or even into the underlying natural. In an area where these undulations become more pronounced the further north one moves, this can have a significant impact upon identification, management and interpretation. This problem is compounded by the longer sequence of landscape change. This sequence is far from uniform, but the trend towards increasing 'wetness' means that parts of the fen-edge and other low-lying settings which had seen long histories of activity were effectively removed from the round before their counterparts further upslope. As a consequence, there is not only a greater potential for 'higher' sites to have longer histories, but also a danger that our picture of earlier landscapes will always tend to be less complete.

This issue of visibility makes close integration with the broader palaeoenvironmental sequence all the more crucial. There is now a considerable body of stratigraphic and palynological evidence available from the south-eastern fens to the north-east of Cambridge with which to reconstruct a reasonable picture of the development of this part of the fenland. Extending beyond the strict limits of the transect, this synthesis attempts to describe and integrate all of this previous and current environmental work, and to relate it to the present investigation. All radiocarbon determinations are given as calibrated dates where possible (after Switsur in Waller 1994a, 321–31); the pre-6000 BP dates lie beyond the range of the calibration curve.

Environmental synthesis

by Charly French

The study area is effectively defined by the open Welney Washes to the north, the Isle of Ely to the west, the Cambridgeshire fen-edge between Waterbeach, the Swaffhams and Burwell villages to the south, and the chalk/gravel uplands of the Suffolk/Norfolk borders skirting from north-east of Newmarket north-eastwards towards Mildenhall and Lakenheath. The most relevant maps of the study area are figs 5.12 and 7.1 in Waller 1994a, 63 and 112, which show the current towns and villages, areas of higher ground, former meres and the sites of previous and present environmental studies from this region. The Isleham sites and palaeochannel are located in the south-east of this fen basin, more or less at its most landward/inland point.

Waller (1994a) has already summarised previous environmental work (*e.g.* Churchill 1970, Clark 1933, 1936, Clark and Godwin 1960, Clark *et al.* 1935, Gallois 1988, Godwin 1940a, Shawcross and Higgs 1961). In addition, Waller (1994a) has contributed (with various other authors) another set of seven well-dated palynological studies of relevance to the Isleham/Snail valley study area of the Anglian Water pipeline. Smith *et al.* (1989) have also re-examined the Shippea Hill complex first investigated by Clark *et al.* (1935). The current work of Wiltshire (Chapter 5) and Murphy (1996) usefully augments the pollen, botanical and molluscan data for the later Neolithic/earlier Bronze Age period at an inland location, well beyond the influence of the marine incursions. Nonetheless, the Snail valley area was affected by the general rise in fenland base-water levels from the Neolithic through to the post-medieval period, and in particular during the growth of the upper peat from the earlier Bronze Age.

Essentially, there is a major four-part sequence of Flandrian sedimentary events in this fenland region: basal peat, 'fen clay' marine incursion, upper peat and an 'upper silt' marine incursion. Although each major event is not represented everywhere and/or uniformly in the basin, the major events are broadly synchronous across the study area. The dating of these major events is no longer based solely on the Shippea Hill sequence as first set out by Clark *et al.* (1935) as the sedimentary sequence there has been demonstrated to be atypical in date range, representing the infill of a large, partially eroded channel (Smith *et al.* 1989). Godwin's pollen diagrams of the 1930s and 1940s (see Godwin 1940a) only show arboreal or tree/shrub types of vegetation, therefore making it very difficult to draw inferences concerning any human impact on the vegetation.

The deepest basal peat investigated in the region is located in Welney Washes at –7.04 to –7.23m OD. Waller's investigations (1994a, 143–152) date this to pre-5365–4836 cal. BC (Q-2824), and it is suggested that all the fen deposits formed to the south and east above this level occurred after this date. By inference, for most of the Mesolithic period fen vegetation was confined to channels with marine influence absent and dry land vegetation predominant.

The long-lived Mesolithic use of Shippea Hill at Peacock's Farm was over by this first period of peat deposition at Welney. Re-investigation of this seminal site by Smith *et al.* (1989) has indicated that there was Mesolithic occupation on the sand ridge at Peacock's Farm between about 7581–7540 and 6423–6378 cal. BC. The whole area was a very well wooded landscape which witnessed its first, minor opening-up at *c.* 8250 BP, marked by a decline in *Corylus* (hazel) and slight increases in Poaceae (grasses), but nevertheless indicative of a pronounced human involvement in the local environment. These relatively open conditions persisted for some 700–1500 years before forest cover was re-established by about 6100 BP, coincident with the first peat development in the most low-lying part of the fens to the north-west at Welney. There then followed a period of about two millennia between about 5051–4991 and 2836–2581 cal. BC where there is very little evidence for what was going on in the fen outside the Little Ouse river channel itself. For example, at Welney, there was a brief marine episode (prior to 'fen clay' deposition) between 6170 BP and 5850 BP (Q-2823; 4970–4485 cal. BC), but its limits/extent are unknown and not mapped (Waller 1994a, 143–52).

The pollen analyses at Wicken Fen, Peacock's Farm and Adventurer's Fen provide evidence for the onset of basal peat formation in this basin between about 4500 BP (or *c.* 3365–3000 cal. BC), coincident with rising base water levels in the basin (Waller 1994a, 153). For example, at Wicken, a *Tilia* (lime) dominated woodland became subject to rising water levels and the development of an *Alnus* (alder) dominated fen carr with abundant marsh ferns and a *Corylus* (hazel) dominated fen-edge woodland (Peglar in Waller 1994a, 114–18). This then gave way to sedge fen, with evidence of more extensive clearance. It is marked by decreases in oak, lime, elm, ash and hazel, increases in *Plantago lanceolata* (ribwort plantain) and *Pteridium* (bracken) with charcoal, and a rise in Poaceae with large annulus diameters of >8μm which is suggestive of cereal-type grasses. This evidence all points to anthropogenic influence in the few hundred years prior to the subsequent 'fen clay' inundation in the later Neolithic.

At Shippea Hill, the earlier Neolithic use of Peacock's Farm would appear to have been minimal, whereas Letter F Farm saw mainly earlier Neolithic occupation in the first half of the 4th millennium cal. BC (Smith *et al.* 1989). However, at both of these sites there was very little evidence of damaging effects to the local environment observable in the pollen record. It is suggested that this is indicative of short-duration use, perhaps brief visits by hunting/foraging parties as part of a more differentiated settlement pattern (*ibid.*), unlike more permanent sites on the fen-edge such as Hurst Fen to the east (Clark *et al.* 1960). Nonetheless, in the most recent pollen analyses there was evidence for a major elm decline at about 5600 BP (or *c.* 4715–4270 cal. BC) and a more minor one at about 5300 BP (or *c.* 4370–3850 cal. BC), which equates with other dates for the elm decline in the region and beyond (Clark and Godwin 1962; Godwin 1975a). At most, the pollen evidence suggests very limited local clearance. More sites of this period in this region such as at the Snail palaeochannel need identification and analysis. Certainly, all activity at Shippea Hill had ceased by the onset of the 'fen clay' deposition, and perhaps its abandonment may have been ultimately associated with this event itself.

The deposition of the 'fen clay' was the next major widespread event (Waller 1994a, fig. 5.18, map 6, 71). Its maximum extent is well established, rarely occurring above –1.0m OD and with no evidence of significant variation throughout the area. The earliest date for 'fen clay' influence is found again at Welney Washes, at 4865–4355 cal. BC (Q-2822), where it continued to 2465–2075 cal. BC (Q-2821). This is a similar end-date to that recorded at other locations on the fen-edge, such as at Redmere (3095–2720 to 2485–2130 cal. BC), Wood Fen (2925–2495 to 2465–2040 cal. BC; Q-2581, Q-2580) and Feltwell Common (2910–2495 to 2470–2050 cal. BC; Q-2548, Q-2551) (Waller 1994a, 152). Outside of the lowermost parts of the fen and channels, the 'fen clay' transgression occurred throughout the 3rd millennium cal. BC across the region (*ibid.*, 153). New analyses at Peacock's Farm (Waller and Alderton in Waller 1994a, 118–24) indicate that 'fen clay' deposition occurred some 400 years later than Godwin (in Clark and Godwin 1962) had originally suggested for this event so far up the Little Ouse channel.

The 'fen clay' represents a brackish/salt marsh or coastal reed-swamp environment, dissected and drained by tidal creeks or roddons and quite similar to the present-day landscape of the coast of Essex. It was probably not lagoonal as there is no solid evidence for coastal barriers, nor for areas of deep water. The 'fen clay' as a deposit tended to accumulate in the creeks or channels, and then spread out over a much wider area under high tide conditions. Perhaps, initially, it would have provided a new set of perimarine resources, before becoming a more inhospitable landscape, made especially difficult to get across because of shifting, wet silt mud in the channels bounded by dense reed-beds.

On the landward, fen-edge fringes of the tract influenced by the 'fen clay', freshwater peats continued to form. At present, there is insufficient data to map this fringing peat zone accurately. For example, at the Snail valley sites (Hall 1996; Wiltshire, p.62 above) and West Row, Mildenhall (Martin and Murphy 1988), there would have been peat growth on the immediate dry land/fen-edge interface, with the 'fen clay', tidal creek, perimarine zone several hundred metres to 1–2km beyond to the north-west and west, respectively (Waller 1994a, fig. 5.18, map 6, 71). This would have given Late Neolithic/Early Bronze Age people use of a number of different environmental zones — a partly-wooded upland to the south and east, fringed by a fen-edge zone of willow/alder carr to sedge fen type of environment, with peat growth with pools of open water to the north and a tidal, perimarine zone beyond.

From 2286–2200 cal. BC, there began a seaward extension of freshwater conditions (Waller 1994a, figs 5.19 and 5.20, maps 7 and 8, 73–4). The existing radiocarbon dates are quite consistent and indicate that this change occurred over a relatively short time over a wide area. Waller (1994a, 154) suggests that this upper peat formation and coincident rising base water levels occurred over the whole region. In many instances, it may have led to the abandonment of sites and/or rendered them unusable, as has been suggested in the case of the abandonment of West Row (Martin and Murphy 1988). In addition, these natural factors would have gradually affected the lower-lying parts of the Snail valley (below about 1m OD). Certainly, this has been the case elsewhere in the northern Cambridgeshire fenland region as detailed archaeological and environmental studies have shown: for example, at several sites in Borough Fen and Flag Fen (French and Pryor 1993; Pryor 2001).

The development of the upper peat was initially associated with willow, and to a lesser extent alder carr. In many cases, coincident with rising base-water levels, this gave way to sedge fen and more open water conditions. In several pollen diagrams (*i.e.* Wicken Fen, Redmere and Welney Washes), this change is accompanied by the virtual disappearance of lime trees, with *Quercus* (oak) relatively increasing as lime and alder fall. Also, plantain and Poaceae occur more regularly, and may indicate more widespread clearance in the region (Waller 1994a, 154). This was occurring throughout the first half of the 2nd millennium cal. BC, and slightly earlier (around the very late 3rd/early 2nd millennium cal. BC) at other sites such as West Row (*ibid*.).

At the Snail palaeochannel, the botanical record contained in the wood peat indicates a varied environment (Wiltshire, p.62 above; Murphy and Robinson 1996). It comprised a drier, partially wooded and open grassland landscape on the drier ground to the south-east, with hawthorn, elder (*Sambucus*), lime, oak and herb species, a river's edge environment with alder, hazel and willow, and wetland/aquatic species in the channel itself. The well-vegetated Snail channel took little flow for most of the year, but it was episodically flushed out by flowing water. The adjacent dry land —former woodland soil — undoubtedly became more open and might possibly have supported grazed grassland and/or arable agriculture. It soon became subject to colluvial influence, while the channel became subject to alluvial influence and overbank flooding. Both of these processes are indicative of some clearance and soil disturbance of the immediate dry hinterland. Certainly at the Prickwillow Road site on the Anglian Water pipeline project, there is considerable evidence for settlement just above the fen-edge in the earlier Bronze Age. It was apparently unaffected by rising water levels and peat growth, and set in an open landscape.

A second marine or 'upper silt' phase has been observed between about 425–140 cal. BC (Q-2819) and cal. AD 10–605 (Q-2818) in the Washes at Welney; this interrupted freshwater peat growth in the northern part of the region (Waller 1994a, fig. 5.20, map 8, 74). It is coarser than the silty clay of the 'fen clay' and was therefore deposited in a higher energy environment. The maps of Waller (*ibid*.), Seale (1975) and Gallois (1988) indicate its limited extent: effectively it is confined to a zone around Welney and does not extend landward to fen-edge localities such as Isleham. There has been insufficient mapping and analysis to be sure of how extensive and synchronous this event was, but as it does not occur in channels it probably occurred in a wide range of sedimentary, overbank environments.

At about the same time, the freshwater mere at Redmere, immediately to the east of Shippea Hill, had begun to form, around or after cal. AD 15–280 (Q-2593). Both Jennings (1950) and Waller (1994a, 124–33) suggest that it may have formed during and in response to the 'upper silt' marine transgression, with the 'upper silt' effectively blocking drainage of freshwater out to the sea and leading to ponding-back of freshwater. Specific work at the other meres in the region is needed to establish any temporal correpondences in their formation patterns. However, with nearby Willingham Mere beginning to form by 40 cal. BC–cal. AD 220 (Q-2582) (Waller 1994a, 158–63), a cause/effect relationship may have been at work on a greater, regional, scale.

Beyond this marine interruption and mere formation phase, upper peat formation continued over the whole southern fenland region until the advent of drainage in the 17th century AD (Waller 1994a, figs 5.21 and 5.22, maps 9 and 10, 76–7). In extent, the upper peat influenced most areas below the 2m OD contour which defines the present day fen-edge in south-eastern Cambridgeshire. Its development was coincident with a continued and gradual opening-up of the landscape and a greater intensification of land use.

The considerable body of recent work by Waller (1994a) and others associated with the Fenland Project has provided a much more detailed and accurate picture of the formation of the south-eastern fens immediately to the north of the Isleham pipeline sites. This has both complemented and enhanced the picture revealed by the seminal investigations of Clark and Godwin in the 1930s to 1960s.

The fen-edge embayments would have been optimum locations for people to take advantage of the various resources presented in the changing fen landscapes from the Mesolithic through to the medieval period. The Snail valley sites of Hall (1996) and the pipeline transect results have shed light upon integral parts of this changing fen-edge landscape. Not surprisingly, many of the sites follow the edge of a peninsula of dry land jutting out from the Snail valley north-westwards into the peat fen.

Gradually rising water tables by the earlier Bronze Age probably had some detrimental effects upon humans, not least in the way they reshaped traditional patterns of movement and residence. That said, they were also life-sustaining. They supported a variety of processing activities and ensured the continued procurement of various natural resources. Potentially, the fen-edge sites would have been able to take full advantage of the landscape in all directions. Inland and on higher ground there was woodland which was gradually being cleared throughout the last two millennia BC; this tract would have featured well drained former woodland soils, both calcareous and fertile, as well as hard geology for stone and flint procurement. The river valley and fen-edge fringes provided natural spring meadow grassland, reeds, willow and alder for building materials, gravel riverbeds and banks for flint pebble raw materials, and water for a variety of preparation tasks; these would have included working stone, bone, hides and bark, as well as various cooking activities. Fish, fowl, and bird life would have abounded in the fens beyond, all readily accessible by water. In short, a varied and resource-rich landscape would have been available year round, in contrast to the main impression of the fens today as monotonous, 'agri-business' flatlands.

III. Discussion

This variety in potentials or 'affordances' needs to be considered in relation to recent reappraisals of prehistoric occupation practice: in particular, a questioning of interpretative models for both the Neolithic and the Early

Bronze Age (*e.g.* Brück 1999; Pollard 1999; Whittle 1997). The debate has sometimes been overly polarised, and has not always acknowledged variability in the character of occupation traditions from one region to another (Cooney 2000; Thomas 1999). However, it has encouraged an interest in defining scales of analysis that work at the level of inhabited landscapes, rather than of sites or more abstracted regions. This, in turn, has fostered interest in the *specific* character, scale and temporality of particular landscape traditions, and that is what concerns us here.

At a broad scale, the transect results appear to add weight to established argument by virtue of the paucity of lithic evidence on the heavier clays. What this represents is uncertain; the situation is not made any easier by the fact that the pipeline route cuts through some zones at an oblique angle, or to only a limited extent. Taken at face value, it might suggest an avoidance of the heavier claylands in favour of lighter, relatively well drained and more easily worked soils on the chalk, and on sand and gravel islands and peninsulas. As Christopher Evans points out, however, there are plenty of examples from elsewhere in Britain and on the Continent to demonstrate that prehistoric communities were more than capable of occupying clay regions before the Iron Age. There is also evidence from the region itself that cautions against drawing such a hard-and-fast line. Recent investigations on the Iron Age enclosed farmstead at Wardy Hill, on the margins of Ely, recovered a significant volume of worked and burnt flint reflecting activities in earlier periods (Evans 2003). Much of this material, including a remnant burnt mound, is likely to date to the later Bronze Age, but there is also a component that reflects activity in the later Mesolithic/ Early Neolithic era. Often revealed by chance during excavations directed towards later periods, a Mesolithic and Neolithic presence has also been identified in the form of blades, microliths, arrowheads and prepared cores from Hurst Lane Reservoir (Evans and Knight 2000) and from West Fen Road (Mortimer *et al.* 2005). A similar range, weighted towards 'products' rather than production, was identified at Trinity Lands and at Brays Lane. Around Ely in general, there is a history of chance discoveries of more distinctive items such as arrowheads and polished flint and stone axes which demonstrate that this was by no means *terra incognita* for communities in the fifth and fourth millennia BC.

The picture is fragmentary and, to some extent, the product of an historical imbalance in fieldwork across the region as a whole. But the evidence suggests that what we are dealing with is not a lack of settlement, but a difference of emphasis in the ways in which varied and probably complementary landscapes were occupied and used. Put simply, differences of task, scale and, perhaps above all, duration (Edmonds *et al.* 1999) are involved. This accords with the palaeoenvironmental sequence, which shows that Ely was not the isolated isle that we have come to take for granted until the later first millennium BC (Waller 1994a). Connected directly to the central fenland islands as part of a large peninsula until *c.* 3000 BC, the area offered gravel-rich margins and higher, heavier, ground — an ecological diversity of considerable potential for communities from the Mesolithic onwards.

Just how that potential was drawn upon is difficult to determine in detail from the evidence of the transect alone. However, it may be useful to think in terms of lighter soils on the gravels sustaining more persistent occupation, with use of both higher and lower country for hunting, stock husbandry and the 'harvesting' of a range of resources, some of them seasonal (Pryor 1996, 1998). This is supported by the differences observed between assemblage structures. Scatters or spreads of worked flint in and around Ely are generally lower in density and less extensive in their component range than many of those found on the chalk at the other end of the pipeline. They also tend to have a higher relative frequency of finished artefacts, products and waste from the ongoing working of material rather than primary production *per se*. Once again, the picture is not black-and-white and, being based largely on variability in stoneworking, it is likely to be partial. That said, it does suggest a difference in the ways particular places were used, and how long/how often they were used.

In a strict sense, the pipeline does not in itself take us very far onto the clay, nor onto the lower, peat-sealed, gravel terraces where prehistoric occupation might be expected. What it does confirm is the remarkable richness of the evidence from the sand and chalk around Isleham. Even here, however, the material requires close scrutiny. The line of the transect creates a curious impression because it runs almost parallel to a major palaeochannel for part of its course. This means that our 'window' often looks onto numerous 'events' and task specific areas on the fen-edge, and not at the full extent and character of activities, often located upslope. The evidence is consistent with significant activity in the immediate area in the earlier Neolithic, and, most likely, in the later Mesolithic. As elsewhere, elements of continuity in stoneworking between the two periods may mean that our assessment of the Mesolithic contribution to assemblages is an underestimate (Edmonds *et al.* 1999). However, a presence at this stage can be inferred both from the palaeoenvironmental sequence and from the local recovery of microliths (see below; Hall 1996). Also common are artefacts and technologies likely to date to the later third and earlier second millennia, the later Neolithic and Early Bronze Age. In almost every case where a substantial assemblage was recovered, there was a sense of places being used and used again over long sequences.

The range of stoneworking tasks represented here is interesting. Around the palaeochannels of the River Snail, the range extends from the dressing of cores to their careful, considered reduction and the use of products. There are also hints of other kinds of stoneworking, geared towards the finishing and maintenance of other tools. While waste material is not, in itself, strongly diagnostic, it is likely that this wide range was a characteristic of the earlier phases of occupation/activity. Near the end of the pipeline (TT63), the range is broadly similar, but with a slightly greater emphasis upon the use of products, rather than stoneworking itself. Given the presence here of more irregular debitage and diagnostically later artefacts, it is possible that this shift is a product of changes in the ways that the area was used over time. That said, the assemblage is limited in size and we should acknowledge that other factors may be at work behind these patterns.

Most dramatic, perhaps, is the evidence of the burnt flint. Such material is notoriously difficult to characterise or date. In this case, however, there was an extraordinarily high frequency of pieces which showed signs of working prior to burning. This is interesting in itself, and suggests an emphasis upon selecting stone for burning from midden or other accumulations, rather than directly from the drift. What matters here is that the size and condition of many burnt flint pieces was sufficient to allow the identification of diagnostic artefact types. These included burnt blades, serrated flakes and cores, the latter being particularly well represented. This is perhaps not surprising, since 'lumps' of flint with a greater mass might have been preferred where burning was geared towards heating stone for subsequent use. The forms still recognisable within this material included several consistent with a date in the later Mesolithic or earlier Neolithic. This cannot be taken as a reliable indicator of the date for all the burnt flint identified along the transect, particularly when there are clear differences of context and character. However, it does suggest that rather than being simply a convenient area for dumping material, the flanks of the peninsula and the river banks themselves were important as a locus for activities that included the heating of stone and the deposition of 'spent' flint along with other by-products and used materials.

Just what the local context of these activities may have been is difficult to determine from the pipeline results alone. Here, though, it is sufficient that the patterning of lithics revealed by the transect evaluation provides at least some way in to the character of later prehistoric activity across a highly varied set of landscapes. The window is a narrow one and the record partial, biased as it is towards those activities that involved the working and deposition of stone. That said, it is clear that activities in different landscape settings can be to some extent characterised in terms of the kinds of lithic *biographies* they produced. Places of episodic activity, where it was common to bring tools and cores for the duration of a stay. Hunting on higher, often wooded ground, watching stock on the edge of a clearing, harvesting or fowling on the edges of carr and reed swamp. Elsewhere, a more persistent presence, recognised in scatters, middens and even burnt flint mounds. Some sites saw more sustained occupation where both the range and the repetition of stoneworking (and other tasks) was that much greater.

More extensive work elsewhere in the Cambridgeshire fens confirms the tendency for the range and density of artefacts (and thus stoneworking tasks) to vary according to geological and soil conditions (*e.g.* Healy 1996). Even on the same basic geologies, there can be subtle variations in assemblage composition — a weighting towards different ranges of tasks, hints of which can be traced in a comparison of blade:blade core ratios across nearby scatters. This demonstrates shifts of emphasis between procurement, production and use across different islands and peninsulas, a signature of people moving between different places and perhaps of cycles maintained over time (Edmonds *et al.* 1999). Once again, these signatures are not easy to read, particularly where specific locations saw changes in the character and duration of their use (Healy 1988). However, they accord with a model of landscape occupation which saw a measure of routine movement and a 'taskscape' structure that carried people into different settings at different times. Given the unhelpful polarisation of recent debate, what needs to be emphasised here is that this view is not in any way incompatible with models that envisage the more persistent occupation of particular areas. Some movement was probably seasonal; some probably operated on still shorter timescales. However, there were also places where the duration of activity could be measured in years and perhaps in generations (Pollard 1999). In ecologies that were both varied and dynamic, it would perhaps be

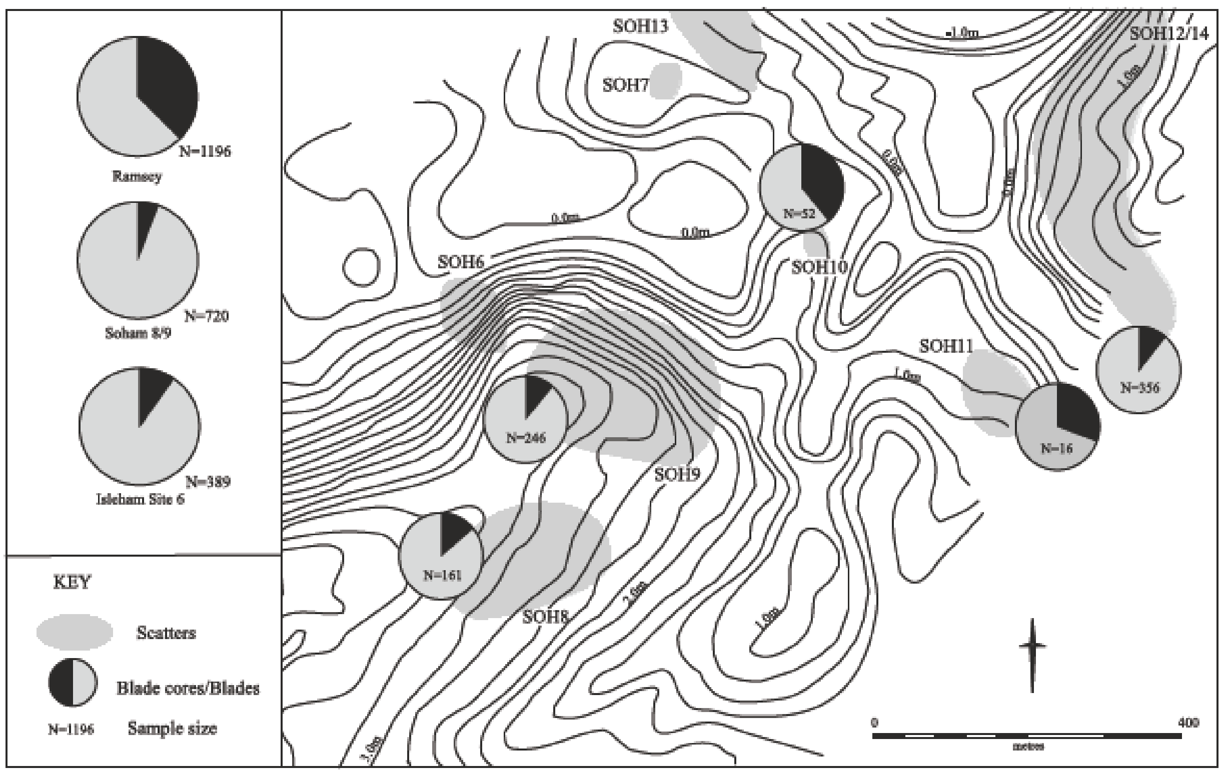


Figure 40 The Eye Hill environs: ratio of blades to blade cores in 'early' assemblages, with insets for Isleham, Ramsey and Soham 8/9 (after Edmonds *et al.* 1999, 76, with additions)

surprising if this were not the case. Established as early as the fifth millennium BC if not before, these traditions continued into what we call the earlier Neolithic, the use of some parts of the landscape becoming more persistent or reiterative around the beginning of the fourth millennium BC. The narrow window across Isleham shows that these areas were reworked well into the Bronze Age.

The palimpsest of scatters across Isleham certainly seems to speak of persistence. However the densities and distributions are by no means transparent, and may in fact indicate that even in this more 'sedimented' country the pattern of occupation was not entirely fixed. An additional phase of fieldwalking (see Chapter 5) demonstrated this exceptionally clearly. Running for *c*. 1km along the route of the pipeline, this corridor was walked in 10m units on a line that cut through three identified sites (Site 4/TT47, Site 5/TP38–40 and Site 6/TT36 and 37). Nowhere did the lithic densities reduce sufficiently to permit clear definition of scatter edges. Instead, the character of the material suggested an extensive, near-continuous spread of occupation/activity from the earlier Neolithic to at least the earlier Bronze Age, with slight traces of a Mesolithic presence.

This raises various interpretative issues, among them the question of *background*. The densities along the transect suggest the existence of core or site areas, but these are surrounded by near-continuous distributions, with densities that would be taken to indicate respectable 'sites' in other parts of the region. So what do these 'backgrounds' represent? One obvious factor here is time depth, reflected in the fact that the greatest fieldwalking concentrations are found, unsurprisingly, in areas with the longest sequence of diagnostic artefacts. This reminds us that basic surface densities often say as much about the longevity or persistence of a place as anything else. Of course, that still leaves the character and scale of activity at various points in the sequence to be determined (Edmonds *et al*. 1999, 48). When set against the palaeoenvironmental record for the Isleham area, the surface patterning along the transect is difficult to reconcile with large-scale and continuous settlement from an early stage. Instead it suggests that the scale of occupation was probably small, with perhaps a cyclical quality: a fen-edge used for specific tasks at one time becoming a focus for settlement at another; specific places abandoned before subsequent returns; the same ground used in different ways. It is this variety, operating at scales beyond the seasonal and probably beyond the lifetimes of individuals, that our simplistic models often miss. There is no reason to assume that this diversity simply disappeared with the establishment of more sustained open conditions in the earlier Bronze Age.

Appendix 1. Catalogue of artefacts illustrated in this volume

Fig. 18. Illustrated flints from F.149

18.i Butt fragment of polished flint axe. Extremely heavy white patination. Evidence of auxilliary working after breakage, using break surface as a striking platform. Thin facets on both laterals.

18.ii Butt fragment of polished flint axe. Extremely heavy white patina with deep weathering visible in places. Break has formed a large hinge fracture.

18.iii Blade with fine serrated edge. White patina.

18.iv End-scraper. Light brown flint with white patina.

18.v Crude, bifacially worked discoidal core. Areas of fresh cortex. White patina.

18.vi Piercer on broken flake. Small area of fresh residual cortex. Grey patina.

18.vii End-shocked butt of bifacially worked miscellaneous implement. Grey patina. Residual cortex clearly waterworn.

18.viii Bifacially worked artefact, possibly a core fragment. White patina. Fresh chalky residual cortex

18.ix Bifacially worked implement with small area of fine retouch. Patinated white. Large area of residual fresh chalky cortex.

18.x Butt end of bifacially worked implement. Broken during manufacture. Possibly fragment of blank for a chisel or knife. White patina.

18.xi Crude bifacially worked discoidal core. White patina.

Fig. 23. Illustrated flints from Prickwillow Road (Site 1)

23.1 FW6. End-scraper. Made of black flint with dark grey patina. Possible additional retouch to left lateral.

23.2 FW4. Side-end scraper on broken flake (proximal missing). Bold, steep retouch on distal, finer working to left lateral. Black flint with patina bloom. Residual cortex slightly waterworn.

23.3 FW4. Transverse arrowhead. Dark grey flint with light brown mottled grey patina. Produced with minimal working to thin flake. Limited retouch: restricted to proximal and distal of original flake (latter obscured by break).

23.4 FW6. Bifacially worked discoidal core. Flake scars and core edge indicate use of soft hammer technique. Residual cortex stained but displays many characteristics of fresh chalk flint. Black flint.

23.5 FW19. Bifacially worked fabricator. Grey-brown flint with slight patina bloom. Possible use damage to tip.

Fig. 24. Diagnostic pottery from Prickwillow Road (Site 1)

24.1, .2 F.58 *229* Spit 4. 4 sherds including 2 base sherds (not refitting). Fabric: pinky buff external surface on dark grey, grey brown core and internal surface. Characteristic soapy fabric of the Collared Urn ceramic tradition.

24.3 F.61 *235*. Beaker body sherd. Orange brown external surface decorated with square-toothed comb impressions in 6 irregular horizontal rows. Pale grey internal surface and dark grey core.

24.4 F.54 *215*. Two sherds (refitting as one). Slack, ill-formed collar (like Longworth's Primary Series). Decorated: impressed twisted cord in diagonal rows bordered below, on the collar/shoulder, by one or two parallel horizontal rows of the same impressions. Fine and coarse moderate grog inclusions in grey buff fabric with pinky/orange buff external surfaces.

Fig. 29. Diagnostic pottery from the Snail Palaeochannel

29.1, .2 TP86 *202*. Rim and decorated neck/body Beaker sherds. Barbed wire decoration on neck zone, below two thick horizontal grooves immediately below out-turned rim; slightly point-everted/externally expanded rim (undecorated). Band of 6 rowed barbed wire horizontal dec. Then undecorated gap. Resumed barbed wire decoration below. Good surface treatment, smoothed/wiped before decoration on both sides (hides temper well). Occasional-moderate fine and medium flint and sub-rounded stones. Shiny pieces of very fine quartz/sand. Firing blooms on external surface (dark and mid grey) on otherwise mixed pinky, orangey buff external surface. Dark grey core, mid grey internal surface.

29.3 TP17 *202*. Abraded Beaker body sherds. Sand and fine flint temper in orange buff paste. Horizontal lines of square-toothed comb impressions border comb-crescents and single lines.

29.4 F.200 (edge silts). Large flat pot base in poor condition. 125mm x 115mm Pale grey buffs external surfaces and internals surfaces, with dark grey core. Poorly- or non-fired; eroded. Uneven internal base surface; wiped. Flared outer surface from base. Grog, chalk and vegetable temper plus some fine sand.

29.5 F.6 (F.200). Complete thumb pot: 38mm high, 5mm thick. Crushed flint and shell tempered pale brownish grey fabric. Inturned simple rim, 60mm in diameter, with trim marks evident on the external surface. Soft, unstable fabric when first uncovered: did not seem to have been fired

29.6 F.130 *396*. Neck/shoulder sherd. Fine quartzite and flint (occasional). Pale brown buff surfaces on dark grey core. Diagonal impressions of square toothed comb bordered by horizontal impression.

Fig. 32. Selected lithics from survey and excavation at the Snail

32.6 TP 68 *202*, Single platform narrow flake core. Patinated blue-grey. 50% of surface area retains cortex with distinctive waterworn appearance.

32.7 TP 27 *202*. End scraper. Produced on blade of light brown flint with large black inclusion running through at proximal end. Very slightly patinated.

32.8 TP40 *201*. Sub-circular scraper on grey patinated flake.

32.9 TT36 *062*. Laurel leaf on light brown flint. Small patch of waterworn cortex.

32.10 TP34 *201*. Unifacial knife with plano-convex profile. Invasive retouch around entire edge. Small area of fresh chalky cortex. Made on blade/laminar flake with 'incipient' thermal fracture forming part of ventral surface.

32.11 *063*. Obliquely blunted point. Patinated white.

32.12 TP34 *201*. Single platform narrow flake core. Very heavy white patination. 30% of surface retains white chalky cortex.

Fig. 33. Selected lithic artefacts from the enhancement survey test pits and fieldwalking

33.13 FW62. Single platform core. White-blue patina

33.14 FW46. Single platform blade core. Blue-white patina. Area opposite platform shows extensive battering, which may be evidence of subsequent use as a fabricator following exhaustion.

33.15 FW27. Single platform blade core. Area of residual thick, chalky cortex. White-blue patina.

33.16 TP 51 *001*. Multi-platform core on sponge flint. Residual cortex characteristic of fresh chalk flint. Material is riddled with hair-line fractures.

33.17 FW25. Bifacial circular knife on flake. Black flint with dark blue patination.

33.18 FW16. Crude scraper, possibly made on thermal fracture product. Intense white patination with abrasion to the ridges on the dorsal surface.

33.19 FW8. Horseshoe scraper on squat flake. Breaks show black flint interior of now blue-white patinated surface. Dihedral butt.

33.20 FW67. Thumbnail scraper on whole flake. Undiagnostic residual cortex. Blue-white patina.

33.21 FW 73. Bifacially worked fabricator on blade. Hinged distal termination and evidence of use-wear.

33.22 FW90. Retouched divergent flake with residual fresh chalky cortex. Piece has been re-used after initial weathering: proximal is retouched, lateral is notched. Combined effect produces a borer or awl. Ventral and part of distal patinated blue grey: re-working has removed evidence of patina from other areas showing original black flint.

33.23 FW78. Crude transverse arrowhead. White patina.

33.24 TP49 002. Transverse/chisel arrowhead on heavily white-patinated flint.

33.25 TP57 001. Discoidal core on flake or pot-lid spall. Small proportion residual cortex with fresh characteristics. Very heavy edge damage; possibly crushing during production or subsequent use as a fabricator. Blue-grey patination.

33.26 TP14. Irregular, opposed platform narrow flake core. Some residual cortex: dirty but otherwise shows characteristics of fresh chalk flint. Blue patina. Black flint seen at breaks.

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