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HEREFORD BYPASS:

ARCHAEOLOGICAL EVALUATION

REPORT 45

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May 1990

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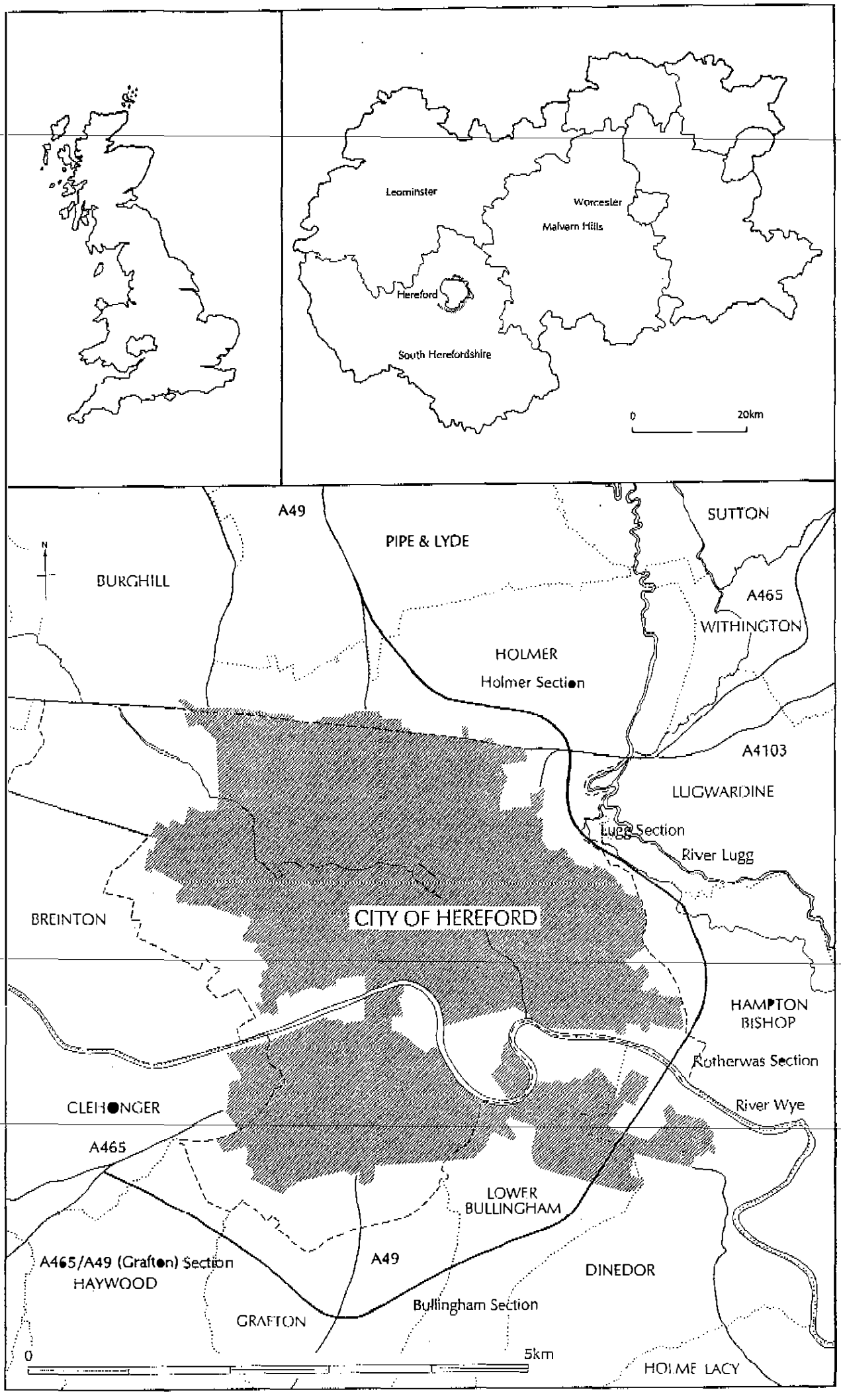
Leominster
Worcester
Malvern Hills
Hereford
South Herefordshire
0
20km
A49
PIPE & LYDE
SUTTON
N
BURGHILL
A465
WITHINGTON
HOLMER
Holmer Section
A4103
LUGWARDINE
Lugg Section
River Lugg
BREINTON
CITY OF HEREFORD
HAMPTON
BISHOP
Rotherwas Section
River Wye
CLEHONGER
A465
LOWER
BULLINGHAM
A465/A49 (Grafton) Section
HAYWOOD
A49
DINEDOR
Bullingham Section
GRAFTON
0
5km
HOLME LACY

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Hereford Bypass: Archaeological Evaluation

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1) Summary

This report describes the results of an archaeological evaluation of the line of the proposed Hereford eastern bypass. This was commissioned by the Department of Transport (DTp) as part of their evaluation of the route, and undertaken by the Archaeology Section of Hereford and Worcester County Council.

Existing records were assessed; these included maps and other documentary sources, as well as the County Sites and Monuments Record (SMR) and air photographs. Fieldwork, using a variety of techniques, was carried out along the proposed route between November 1989 and February 1990.

A low level of prehistoric and Roman activity was encountered along much of the road corridor. Evidence for medieval and later land-use was also recovered.

A number of recommendations are made, which will help to minimise the impact of the road construction on archaeological sites on and adjacent to the route. These include the establishment of an archaeological presence during the topsoil stripping phase, to allow the salvage recording of sites identified during this evaluation, as well as any new sites which may be discovered at that stage. Recommendations are also made for the treatment of a small number of specific sites.

2) Introduction

Between November 1989 and April 1990 a detailed archaeological evaluation was carried out of the proposed route of a new bypass for the city of Hereford, which is to carry the A49 trunk road along a line to the east of the city, linking up with the A465 to the south-west. This work was undertaken on behalf of the Department of Transport as part of their evaluation of the impact of the route.

Consultation between the DTp and the Archaeology Section began early in the process of planning the bypass. The preliminary consultation document issued by the DTp in mid-1987 identified two possible routes, one to the east and one to the west of Hereford. At this point the Archaeology Section was able to identify eleven sites of archaeological significance within 1km of the eastern route, while there were no known sites within 1km of the western route.

The announcement that the eastern route was to be the preferred option was made in August 1988. In addition to the original proposal to link the A49 north and south of the city, it was announced that the southern end would be extended westwards to join the A465 Abergavenny trunk road, extending the total length from 11km to some 13.5km.

Negotiations took place between the Archaeology Section and the DTp in early 1989. As a result of these, the DTp commissioned the Archaeology Section to produce a preliminary assessment of the archaeological impact of the bypass. This was completed in June 1989 (Edwards and Woodiwiss 1989). The report summarised the topography, geology and soils along the route, and discussed the archaeological potential of the area through which the road corridor was to pass, as well as defining a series of techniques which could be used to assess it. A series of maps were included, showing known archaeological sites, soils and current land-use. As a result of enhancement of the SMR between 1987 and 1989, eleven archaeological sites were known within 0.5km of the route at this stage.

The brief for the full archaeological survey was agreed with the DTp in mid-October 1989 on the basis of the programme outlined in the preliminary assessment. As completion of the report was required by spring 1990, and the work was estimated to require five months to complete, it was necessary to begin fieldwork immediately.

This report summarises the results of the archaeological field programme. Fuller details of the results may be found in Appendices 1 and 2, while a complete archive is also available for study (see Appendix 3). The report then sets out recommendations for the treatment of archaeological sites in the proposed construction corridor as notified to the Archaeology Section at the commencement of the survey in October 1989 (the preferred route announced on 13 September 1989).

3) Aims

The primary aim of the evaluation was to secure the appropriate treatment of archaeological sites likely to be affected by the construction of the bypass. This aim was to be achieved by a detailed assessment of current archaeological knowledge, and by a fieldwork programme which would involve the application of several techniques to an area where previous archaeological prospection had been minimal.

There are normally five possible responses to threats to an archaeological site or landscape area; these are graded according to the importance of the site or sites, and the nature and extent of the threat.

a) Preservation *in situ*

This would be the preferred option in the case of nationally and regionally important sites (these may be protected as scheduled ancient monuments). It may be achieved either by recommending

refusal of a planning application, or by the development of a design solution which averts or minimises the threat to archaeological deposits. In the case of road construction, a design solution might take the form of rerouting of the road, or burial of a site below an embankment. Preservation *in situ* would normally be the preferred option on important sites.

b) Detailed recording (preservation by record)
The detailed recording of important sites would be the preferred option in areas where it is not possible to secure preservation by any of the means described above. This would normally take the form of excavation of part or all of the threatened area.

c) Salvage recording
This involves the detailed recording of smaller sites discovered during the survey or revealed by construction work. This would be undertaken at the same time as the monitoring described below. Sites such as burials and other isolated features would be recorded here.

d) Monitoring ('watching brief')
The monitoring of ground disturbance during construction, to check for the presence of less extensive sites.

e) No further action
No further action, in areas where it can be demonstrated that significant archaeological deposits do not exist.

Some further points should be raised here. In particular, consideration should be given to the visual impact that development may have on the setting of significant archaeological sites or listed buildings, with a view to minimising this. In the event of rerouting of all or part of the road, areas which would previously have been unaffected, and have therefore not been surveyed, will require evaluation. This consideration will also apply to areas of disturbance, such as plant sites, which were not defined at the time that the evaluation took place.

4) Methodology and techniques

4.1) Introduction

The archaeological study area was defined by the preliminary assessment as a corridor extending 500m on both sides of the proposed road line. For the purposes of the field survey, it was necessary to restrict the area examined to those areas which were to be directly affected by the road construction (Fig 1). This took into account the width of the proposed construction corridor, including cuttings and embankments

where these were known (information derived from annotated copies of maps WM/212/03/3/01 to WM/212/03/3/05). The Archaeology Section was made aware of the possibility that part of the route would be constructed as dual rather than single carriageway, and the potential effects of this were also taken into account. The extent of junction works could be estimated from the working maps. Plant sites and diversions of other roads were not identified when the fieldwork took place, and were therefore not taken into account.

Due to the required programme, it was not possible to fit the fieldwork fully within the agricultural calendar, as would normally be the intention. Some areas had already been sown with winter crops before they could be fieldwalked, and conditions for the retrieval of finds were in many cases less than ideal. In addition, the exceptionally wet conditions through much of the winter restricted the use of mechanical excavators over most of the area, and test trenches were generally excavated by hand rather than machine. However, a satisfactory fieldwork coverage was possible over nearly all of the road corridor.

The mapping of results is presented using the five sections defined by the DTp:

1	A465/A49 (Grafton) section	south-west of the city	Fig 2 A-E
2	Bullingham section	south of the city	Fig 3 A-E
3	Rotherwas section	south-east of the city	Fig 4 A-E
4	Lugg section	east of the city	Fig 5 A-E
5	Holmer section	north-east and north of the city	Fig 6 A-E

Base plans of all five areas show the current field layout and buildings (Figs 2A, 3A, 4A, 5A and 6A).

4.2) Topography, geology and soils

Mapping of geology (both solid and drift) and soils is variable over the area, and coverage has been obtained from a number of sources, which include maps at various scales. Sources consulted for geological information were: Brandon 1982; Brandon 1989; Earp and Hains 1971; Luckman 1970; and unpublished field sheets held by the British Geological Survey. For soils information the sources consulted were: Hodgson and Palmer 1971; and Ragg *et al* 1984.

The solid geology of the whole survey area consists of Lower Old Red Sandstone of the Raglan Mudstone Formation, made up mostly of red marls, with beds of sandstone, conglomerates and cornstones. The drift geology and soils vary, and will be summarised separately for each section.

The A465/A49 (Grafton) section runs south-east from the A465 at Belmont to the A49 close to the

Grafton Inn. It passes through the parishes of Clehonger, Haywood and Grafton. The topography of this area is uneven, and the land-use mixed arable and pasture, with some woodland. Drift geology, where present, consists of till. The soils are argillic brown earths.

The Bullingham section runs from the A49 near the Grafton Inn to Watery Lane at the rear of the Rotherwas Industrial Estate. It passes through the parishes of Grafton and Lower Bullingham. The western part runs along the valley of the Norton Brook; it then crosses Green Crize Common and the valley of the Red Brook and continues along the north-facing lower slopes of Dinedor Hill. Most of this area is in arable cultivation, although there is some pasture. Much of the drift geology is made up of river terrace deposits, although alluvium is present in the two valley bottoms and there is an area of till around Green Crize Common. The soils are brown earths, with gley or brown warp soils in the valley bottoms.

The Rotherwas section takes in the Rotherwas Industrial Estate, the Wye crossing, and the northern side of the Wye valley, running in a north-easterly direction from Watery Lane in the south to the watershed of the Wye and Lugg to the north. It passes through the parishes of Lower Bullingham, Dinedor and Hampton Bishop, and part of the City of Hereford. South of the Wye it runs through the flat valley bottom, which is mostly occupied by the industrial estate but also includes some waste ground and meadow land, while to the north it climbs some 15m from the river, largely through apple orchards. Terrace deposits form the higher ground to both sides of the river; the River Wye itself is associated with deep alluvial deposits. The soils on the terraces are brown earths, with gleys or brown warp soils adjacent to the Wye.

The Lugg section includes the low-lying ground of the Lugg valley to the east of Hereford, and extends from the Wye-Lugg watershed north and then north-west to the A4103 Worcester road west of Lugg Bridge. All of this section is in Hampton Bishop parish apart from the northernmost part, which is in the City of Hereford. Although there is some arable land at the southern end, most of this section runs through valley-bottom water meadows (the Lugg Meadows). Terrace deposits on the higher ground at the southern end of the section give way to the extensive alluvium of the River Lugg. Soils formed on the terrace are brown earths, with alluvial gley soils in the valley bottom.

The Holmer section is another area of uneven topography, taking in water meadows in the Lugg valley as well as higher ground along the northern side of the Ayles Brook valley. At both ends of this section the smaller fields have been joined into larger arable fields, but the central part of the section retains the pattern of smaller pasture fields which preserve in many cases the layout of the medieval strip-fields. Apart from the northernmost part of the section, which is in the parish of Pipe and Lyde, all of this section is in Holmer parish. It runs north-west from the A4103 to join the A49 to the south of Pipe and Lyde church. The only drift deposits present consist of alluvium in the valleys of the Lugg and the Ayles Brook. The soils are argillic brown earths, with alluvial gleys in the valleys.

4.3) Description of methodology and techniques

The bypass route passes through an area of Herefordshire which, prior to this survey, was of largely unknown archaeological potential. There was no previous survey cover which could have provided a background to the present evaluation, showing the nature of earlier settlement distribution in relation to topography, geology and soils. Other archaeological surveys in Herefordshire, for instance the survey of the Leominster area carried out in 1983 (Mills 1983), have only had a very limited fieldwork component. Although these surveys have suggested a density of settlement and other activity in the prehistoric and Roman periods which is far in excess of that previously known, they have not provided enough data to enable patterns to be analysed. It was the intention, therefore, to cover the whole length of the road corridor by at least one fieldwork technique, rather than to use a random sampling strategy.

The methods of field survey were dictated by land-use, and by the presence of known or potential archaeological sites in the study area. The following techniques were used:

a) Surface collection of artefacts by fieldwalking on arable land. Fields were walked initially by transects, laid out perpendicular to the centre line of the road corridor, and spaced at 25m intervals. This allowed artefact scatters to be roughly located. Where positive results were obtained from this preliminary survey, detailed survey followed, using a 10m grid. Each grid square was searched systematically (line-walked at 1m intervals). This enabled concentrations of finds, which could indicate the presence of sites, to be closely defined. A total of 150 transects and 440 10m grid squares were fieldwalked, in sixteen and four fields respectively.

b) Hand augering, usually at 50m intervals. This technique was used to examine subsurface deposits, mainly on pasture, but also in a number of cases on arable land as a preliminary to test trench excavation. Auger holes were particularly useful in defining areas of potential importance for environmental reconstruction in the valley of the Lugg. A total of 155 auger holes were bored, in 41 fields.

c) Test trenches, their location determined by surface scatters of artefacts or by potential features interpreted from air photographs. These were mostly dug by hand (in four out of the five fields trenched), due to wet weather conditions. This also provided the opportunity to assess material in the ploughsoil as well as on the surface. In only one case (at Rotherwas, HWCM 9090) was machine trenching used.

d) Earthwork survey, of features defined during coverage of the route by other techniques. In practice, earthwork survey in this case was restricted to recording the extent and nature of ridge-and-furrow field systems in two fields.

c) Documentary research, including the detailed examination of existing maps and records (including the SMR), field name surveys, air photographic data (both from the RCHM(E) collections and elsewhere), listed building lists and other primary and secondary sources.

Mapping of the techniques used is included as Figs 2-6B (overlays).

In addition to these techniques, data from the road construction survey boreholes and test pits was evaluated. Such borehole surveys are not undertaken for archaeological purposes, and the superficial deposits, which are the main concern of archaeologists, are rarely recorded in detail for structural engineering purposes.

Geophysical and geochemical survey techniques were not used in this evaluation. These are usually employed to define and characterise archaeological sites located by other techniques, but no sites were encountered which indicated the need for geophysical or geochemical work.

5) Results of fieldwork

To allow an assessment of the significance of the results of the fieldwork, the description and discussion which follows is divided by period. Each period discussion is prefaced by a summary of archaeological knowledge. The periods used are the conventional ones of prehistoric, Roman, post-Roman, medieval, and post-medieval.

The results of the fieldwork are only summarised here. Appendix 1 gives fuller details of the results for each land parcel, and Figs 2-6C (overlays) show the archaeological sites recorded.

5.1) Prehistoric (*c* 10 000 BC to AD 43)

The prehistoric period, usually divided up into Stone Age (palaeolithic, mesolithic, neolithic), Bronze Age and Iron Age, is generally poorly known in Herefordshire. The most recent studies are by Gavin-Robinson (1954), which deals with Herefordshire specifically, and by Stanford (1980), as part of a general work on the archaeology of the Welsh Marches. To a great extent this lack of knowledge is due to the nature of the surviving remains. Most of these have been greatly eroded by later agricultural and other activities, so that little is visible on the surface (though buried remains may be well preserved). Little fieldwork has been carried out in the past, and the archaeological background is therefore not well understood. Recent work (Dinn 1990) demonstrates, however, that there is a spread of prehistoric activity across the whole of the former county, including the central lowland area. This takes the form of:

a) Scatters of flint tools and flintworking debris, representing settlements and/or temporary camps of the mesolithic, neolithic and Bronze Age periods, which can be collected by fieldwalking. Prehistoric pottery, present from the neolithic onwards, does not survive well in the ploughsoil, and is rarely found except by excavation. In cases where finds are made in the ploughsoil, but there is no corresponding evidence in the form of subsoil features, it is generally assumed that ploughing has removed such evidence. The poor survival of pottery in the ploughsoil probably accounts for the very limited distribution of known Iron Age (as opposed to earlier prehistoric) activity in the county.

b) Cropmarks, indicating the presence of buried ditches and other archaeological features. These may be seen from the air, or occasionally from the ground. In Herefordshire they mostly take the form of ring-ditches, which often represent eroded round barrows of Bronze Age date, and ditched settlement enclosures, which are thought to be either Iron Age or Roman in date. An enclosure at Kenchester (HWCM 7250; Wilmott 1980) dated from the Iron Age, and was discovered by chance during the excavation of a Roman settlement. The cropmark evidence has been studied in more detail for Shropshire and north Herefordshire (Whimster 1989). Both feature types are represented by HWCM 226, a scheduled ancient monument (County Monument Here and Worc 190) which lies just to the east of the proposed route. The visibility of features as cropmarks depends on soil type and land-use, as well as on the density of flying coverage, and the absence of cropmarks does not always indicate absence of features. Indeed, in many cases, features may be better preserved where they do not show as cropmarks, for instance where they are covered by alluvium, and it is not unusual for sites to be considerably more extensive than might appear from the cropmark evidence. Cropmarks can also be caused by more recent activity, such as medieval or later farming, military works, or sports fields.

c) Earthwork sites, such as Bronze Age round barrows and Iron Age hillforts (for instance Dinedor Hill, HWCM 1278). Few earthwork sites survive on lower ground, where they have usually been levelled by ploughing, and may be represented only by cropmarks, or not at all.

Little concrete evidence of prehistoric activity was revealed by the evaluation. Finds of flintwork were made almost everywhere, but they were mostly too few in number (generally fewer than five finds per field) to warrant further work. Two scatters were more substantial (HWCM 8465, HWCM 6026); these were examined by trial trench, but neither produced evidence of buried features.

HWCM 8465 was characterised by large quantities of flints of probable Bronze Age date. Over 100 flakes were found during fieldwalking, as well as 14 flake lumps, four blades, four small round scrapers, and two possible scrapers. There were no cores, and proportionally few blades were present.

The assemblage from HWCM 6026 was smaller, and mostly neolithic in character, although there was some Bronze Age material here also. A single polished flint axe fragment was also recovered from this site; it had been broken and reworked into a tool. These axes are of neolithic date, and their distribution in this region has been studied in a recent paper (Darvill 1989). The source of the material for this axe may have been in Wiltshire.

A number of cropmarks were identified as part of the survey, from air photographs in the RCHM(E) and SMR collections, and from vertical photographs taken as part of the preparatory work for the bypass. Three of these were tested by trial trench. In the cases of HWCM 6026 and HWCM 9090 the cropmarks seem to have represented modern features, while the cropmarks at HWCM 9089 may have been related to modern agricultural activity.

5.2) Roman (AD 43 to 400)

The Roman period is slightly better known than the prehistoric period in this area. Towns were established, for instance at Kenchester (HWCM 121), west of Hereford, and a road system laid out. There are a number of Roman finds from Hereford itself (see Dudley 1954 for a general overview of the Roman period in Herefordshire, and Shoesmith 1982, 3-6 for a summary of the evidence relating to the immediate area of Hereford). The Hereford Bypass route crosses at least one such road (HWCM 5559, from Kenchester to Stretton Grandison), now partly followed by the A4103 road to Worcester, and there is thought to have been another road leading southwards from Hereford towards Monmouth (HWCM 9419), which may be followed by the southern part of the A49 and by the A466 towards Monmouth.

Rural settlement in the Roman period is more poorly understood. Many of the cropmark enclosures described above may have continued into, or have been newly established, in the Roman period. Scatters of pottery indicate intensive land-use (they are probably the result of the spreading of domestic refuse on the fields as manure), while denser scatters may mark the positions of farmsteads or small villages. It seems clear that the area of central Herefordshire around Kenchester was relatively densely settled (Shoesmith 1982, 5).

Most of the fields walked produced some Roman pottery, though none of the scatters was dense or extensive enough to indicate the presence of settlement. Most of the Roman pottery was very abraded, and the largest assemblage, from HWCM 6026, consisted of no more than 60 sherds from an area of 1.6ha.

5.3) Post-Roman ('Dark Ages' and Saxon period: AD 400 to 1000)

Even less is known about this period than about those preceding it. It probably saw the establishment of most of the present settlement pattern in the Hereford area. The diocese of Hereford is usually assumed to have been founded in AD 676, and the origins of the city probably date to that period. Excavations in the city have produced little material from earlier than the 8th century, though they have provided considerable evidence for the development of the city in the later Saxon period (Shoesmith 1982, 90). However, outside Hereford, virtually no archaeological evidence survives.

No finds from this period were made during the evaluation.

5.4) Medieval (AD 1000 to 1500)

The medieval period saw the creation of much of the character of the present-day landscape, with the development of villages and towns and the construction of parish churches. Town and village plans and surviving buildings form a major source of evidence, and there is also a wealth of written material. Earthworks, including moats, ponds and field systems (typically ridge and furrow), provide evidence for rural settlement and land-use; the medieval open fields and commons have been largely superseded by smaller individually-owned fields, mostly enclosed in the 18th and 19th centuries.

Finds of pottery and other materials from the medieval period were widely scattered, though in no case in sufficient quantities to suggest the presence of settlement rather than manuring of fields. A possible stone cannonball from HWCM 8619 may have been either medieval or post-medieval in date.

Several medieval villages and other settlements lay within the study area: Grafton, Bullinghope, Rotherwas, Tupsley and Holmer, though only that at Rotherwas is close to the route. There are slight earthworks (HWCM 9438), and a pond (HWCM 9439), adjacent to the road line; however, trial trenching adjacent to the sewage works failed to reveal any features apart from trenches associated with World War I military activity.

The pattern of land-use on the Lugg Meadows (HWCM 9216) is thought to have survived unchanged or little changed since the medieval period or perhaps earlier. Hampton Bishop contained 28 acres of meadow in Domesday Book (Thorn and Thorn 1983), one of the largest areas in the county. It is hard to evaluate the significance of this area in archaeological terms, as this pattern is not reflected by physical features, but its survival as a pattern of land-use and landholding is of considerable interest.

Two small areas of ridge and furrow were recorded in the eastern part of the Holmer section (HWCM 8531, HWCM 8534). A more substantial survival may be found further west in Holmer parish, where

many of the field boundaries preserve the layout of medieval strip-fields (see Fig 6D).

5.5) Post-medieval (AD 1500 to present day)

Nearly all of the visible landscape has been altered since the medieval period. Enclosure of open fields has radically altered the rural land-use pattern, while both urban and rural buildings almost all post-date 1500. Although they may have earlier origins, most of the communication networks (roads, navigable rivers) have been modified in this period, while new ones (canals, railways) have been created. Industrial remains are also widespread.

Much of the evolution of the landscape in the post-medieval period can be studied through maps. Parts of the Hereford area have been mapped by Lobel (1969), although the maps concentrate on the city itself, and tithe maps are a useful source of information for most of the study area. These have been included as Figs 2-6D (overlays; as these are copied directly from the tithe surveys, they may not overlay exactly on their respective base maps). The field name surveys of the Woolhope Club were consulted where these were available (for Holmer; Hampton Bishop and Tupsley; Lower Bullingham, Upper Bullingham and Grafton; Woolhope Club Archaeological Research Section nd a, b, c), while for the remainder of the study area the original tithe maps (HCRO) were used. Haywood, which was extra-parochial, has been mapped from the 1904 Ordnance Survey 6" map.

At SO 52344192 the road line crosses the course of the Herefordshire and Gloucestershire Canal (HWCM 382). This stretch was one of the last canals to be opened in Britain, in 1845 (Cross 1982, 94); it was closed by 1881.

The Hereford Tramway (HWCM 9410), opened in 1829 (Cross 1982, 102), is now followed by the Hereford - Newport railway for much of its route, but the railway diverges from the tramway to the east of Merry Hill, and the line of the tramway is now followed by a public footpath and field boundaries. It is crossed by the bypass line at SO 49103715.

The bypass line crosses the former Shrewsbury and Hereford Joint Railway (HWCM 9412), opened in 1852 (Cross 1982, 109) at SO 52184226, and the Newport, Abergavenny and Hereford Railway (HWCM 9413), opened in 1854 (Cross 1982, 107-8) at SO 49263706. Both of these railways are still in use as part of the British Rail network.

A number of listed buildings and other post-medieval structures of historic interest exist within the study area. These are listed in Appendix 2. The only one of these which is likely to be directly affected by the bypass proposals is a listed milepost at Hampton Bishop (HWCM 9436; SO 53724033).
Some 19th-century industrial buildings along the Roman Road in Hereford fall within the study area: the

works of the Herefordshire and South Wales Agricultural Manure and Cattle Food Company Ltd, later the Victoria tile works (HWCM 9414; SO 517418; Cross 1982, 29, 63), and the Jubilee Cider Works (HWCM 9415; SO 516420; Cross 1982, 61). These will not be directly affected.

5.6) Other results

A number of samples recovered by augering in the Lugg floodplain were found to contain plant remains. These may potentially provide evidence for past environments. However, no dating material was associated with the layers from which these samples came, and they must therefore be considered to have a low significance.

6) Impact assessment

At the start of the evaluation programme, eleven sites had been identified within the study area (Edwards and Woodiwiss 1989, 3, fig 2), and it was estimated that this might be increased by a factor of five. Following the evaluation, the total number of sites recorded has risen to 89, an eightfold increase. These range from findspots of single artefacts to extensive complexes of cropmarks and to standing buildings. A full list of sites identified is given in Appendix 2.

The sites have been assessed using the non-statutory criteria published by the Department of the Environment as a guide (Appendix 4). None of those which are likely to be directly affected by the bypass construction are estimated to score highly enough for further archaeological work to be justified prior to the commencement of construction, or for preservation *in situ* to be considered.

No evaluation of this type can be completely exhaustive, and further discoveries are always likely to be made during road construction, but these are likely to be of a minor nature. The recommendations include consideration of such future discoveries.

7) Recommendations

7.1) Introduction

The evaluation has clearly shown the benefits which may be drawn from an archaeological involvement at an early stage in road planning, and from a continued and phased approach to archaeological assessment work throughout the planning and design process. It has been possible to design and implement a programme which has used a variety of techniques to explore the archaeological potential of

the road corridor.

The recommendations are divided into two parts: those which are general, and refer to the whole road construction, and those which are specific to a single site or area.

The recommendations contained in this report are prepared for advisory purposes only and take account solely of archaeological issues; they refer only to the proposals for road construction existing at this date.

7.2) General recommendations

a) There are no sites on the route for which preservation *in situ* or by record is recommended.

b) The major recommendation is for an archaeological presence during the construction phase, and especially during topsoil stripping. This will enable the monitoring of ground disturbance and the salvage recording of features which may be discovered at this time, as well as of features of lesser significance which are already known (see below, section 7.3). Some areas can be defined as of low potential, and will be given low priority.

Monitoring work of this type is generally classified as rescue archaeology, and an approach may be made to English Heritage for financial support for the work.

c) The route avoids encroaching on any of the scheduled ancient monuments in the Hereford area (HWCM 226, HWCM 547, HWCM 548, HWCM 1278), although it passes close to all of these. Avoidance of these monuments should be a primary consideration if any rerouting is planned for the eastern part of the road. The setting of the monuments at Rotherwas (HWCM 547, HWCM 548; County Monument Here and Worc 123) and Dinedor hillfort (HWCM 1278; County Monument Here and Worc 12) should be considered when designing these sections of the road. In particular, the road will pass about 200m from Rotherwas Chapel. However, the setting of this monument is already compromised by the presence of a sewage works and industrial estate, and it may be felt that the road will not seriously affect it. Advice should be sought from English Heritage on this matter.

d) If rerouting is to occur for non-archaeological reasons, archaeological evaluation of the new route will be required.

e) Early consultation on the location of plant sites and road diversions will make it possible to avoid damage to known sites during the setting up and operation of plant.

7.3) Site-specific and area-specific recommendations

a) Special consideration should be given during monitoring and salvage recording to the areas defined in Figs 2-6E. This includes the following sites: HWCM 6026; HWCM 8465; HWCM 8611; HWCM 8615; HWCM 9089, as well as the Lugg floodplain, where ground disturbance should be carefully checked for datable organic deposits which may provide environmental information.

b) The Lugg Meadows (HWCM 9216) is a large area of meadow which is still managed according to a pattern which may have been established in the medieval period, or perhaps even earlier. Although the presence of rows of electricity power lines detracts from its visual impact, it is nonetheless an area of historic landscape of considerable interest. It is suggested that consideration could be given to moving the route slightly westwards at SO 52834102 to avoid encroaching on this area. However, detailed archaeological work would be required to allow a full assessment of this landscape.

c) A listed milepost (HWCM 9436) on the A438 at Tupsley may be affected by junction works; care should be taken to ensure that this monument is sensitively treated.

8) Acknowledgements

Fieldwork was undertaken by Nigel Topping, Robert Burrows, David Cox and Rodney Cottrill, supervised by Justin Hughes with Dominic Shelley and David Wichbold. This report was prepared by James Dinn. The finds were catalogued and identified by Jane Evans, and the illustrations were drawn by Samantha Whitby, James Dinn, Duncan Brown and David Wichbold. Documentary work was undertaken by Duncan Brown. Hal Dalwood kindly examined the flint assemblage, and Clare de Rouffignac advised on treatment of the environmental samples. The advice and assistance of Simon Woodiwiss at all stages of the project is gratefully acknowledged.

Malcolm Graham of John Burrow and Partners, consulting engineers, provided every assistance. The cooperation of David Wilkinson, Department of Transport project officer, is also acknowledged.

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Woolhope Club Archaeological Research Section, nd, b *Herefordshire Field-name Survey: Hampton Bishop and Tupsley*

Woolhope Club Archaeological Research Section, nd, c *Herefordshire Field-name Survey: Lower Bullingham, Upper Bullingham and Grafton*

10) Abbreviations

HWCM Numbers prefixed with 'HWCM' are primary reference numbers used by the Hereford and Worcester County Sites and Monuments Record.

DTp	Department of Transport
HCRO	Hereford County Record Office
HWCC	Hereford and Worcester County Council
RCHM(E)	Royal Commission on Historical Monuments (England)
SMR	County Sites and Monuments Record

Appendix 1 Detailed summary of fieldwork and results

Overall site no	Fieldwork	Results	Detail no
A465/A49 (Grafton) section			
HWCM 8621	Fieldwalk (12 transects)	1 flint flake	9100
		1 Roman sherd	8621
		Medieval and post-medieval finds	9101
HWCM 8611	Fieldwalk (8 transects)	14 flints (including 1 neolithic leaf arrowhead	8611
	Fieldwalk (62 grids)	and one other arrowhead)	
		14 Roman sherds	9102
		Medieval and post-medieval finds	9103
		Other finds include: burnt stone, bone and fired clay; perforated lead sheet	
HWCM8612	Fieldwalk (12 transects)	1 flint flake	8612
		1 Roman sherd	9445
		Medieval and post-medieval finds	9131
HWCM8613	Fieldwalk (4 transects)	1 post-medieval sherd	8613
HWCM9449	Fieldwalk (4 transects)	No finds	
HWCM 9701	Hand auger (2 holes)	No significant deposits recorded	
HWCM9702	Hand auger (3 holes)	No significant deposits recorded	
HWCM9703	Hand auger (6 holes)	No significant deposits recorded	
HWCM9704	Hand auger (4 holes)	No significant deposits recorded	
HWCM 8614	Fieldwalk (16 transects)	1 flint blade, 1 flake	8614
		4 Roman sherds	9132
		Medieval and post-medieval finds	9133
HWCM 9705	Hand auger (5 holes)	No significant deposits recorded	
HWCM 9706	Hand auger (5 holes)	No significant deposits recorded	
HWCM 9207	Hand auger (5 holes)	No significant deposits recorded	

Overall site no	Fieldwork	Results	Detail no
Bullingham section			
HWCM 8615	Fieldwalk (8 transects) Hand auger (2 holes) Test trench (2 10x1m h.andtrenches)	2 flint scrapers (1 ?Bronze Age) 3 Roman sherds Medieval finds	8615 9134 9135
HWCM 8616	Fieldwalk (4 transects)	No finds	
HWCM 8617	Fieldwalk (10 transects)	Medieval and post-medieval finds	8617
HWCM 8618	Fieldwalk (22 transects)	1 flint flake, 1 flake lump 5 Roman sherds Medieval and post-medieval finds Ridge and furrow cropmarks	8618 9136 9137
HWCM 9707	Hand auger (3 holes)	No significant deposits recorded	
HWCM 9708	Hand auger (5 holes)	No significant deposits recorded	
HWCM 9709	Hand auger (5 holes)	No significant deposits recorded	
HWCM8465	Fieldwalk (4 transects) Fieldwalk (208 grids) Test trench (4 5x2m hand trenches)	Flints (Bronze Age where datable): 106 flakes, 4 blades, 14 flake lumps, 4 scrapers, 2 ?scrapers 19 Roman sherds Medieval and post-medieval finds (including 1 gunflint, 1 Queen Anne sixpence) Other finds include: 8 ?whetstones, 1 glass bead Test trenches revealed no archaeological features, and very little material was recovered from the topsoil; nearly all the finds were made during fieldwalking	8465 9138 9139
HWCM 8619	Fieldwalk (14 transects) Fieldwalk (10 grids)	2 flint flakes 5 Roman sherds Medieval and post-medieval finds Other finds include: 6 ?whetstones, 1 stone cannonball, 1 blue glass bead (Iron Age or Roman)	8619 9140 9141
HWCM 9710	Hand auger (3 holes)	No significant deposits recorded	
HWCM 9711	Hand auger (3 holes)	No significant deposits recorded	
HWCM 9712	Hand auger (3 holes)	No significant deposits recorded	

Overall site no	Fieldwork	Results	Detail no
Rotherwas section			
HWCM 9713	Hand auger (2 holes)	No significant deposits recorded	
HWCM 9714	Hand auger (4 holes)	No significant deposits recorded	
HWCM 9090	Hand auger (6 holes) Test trench (50x1m machine trench) Test trench (30x1m machine trench)	Test trenches revealed cropmarks to be associated with World War I military activity. No significant deposits recorded. No finds	
HWCM9091	Hand auger (2 holes)	No significant deposits recorded	
HWCM9092	Hand auger (2 holes)	No significant deposits recorded	
HWCM 9715	Hand auger (4 holes)	No significant deposits recorded	
HWCM 9716	Hand auger (4 holes)	No significant deposits recorded	
HWCM9717	Hand auger (5 holes)	No significant deposits recorded	
HWCM 9718	Hand auger (5 holes)	No significant deposits recorded	
Lugg section			
HWCM 9089	Hand auger (4 holes) Test trench (3 5x2m hand trenches)	No archaeological features encountered. Finds: 4 flint flakes and 1 core Other finds include: 1 ?whetstone Possible cropmarks	9446
HWCM 9719	Hand auger (8 holes)	1 environmental sample	
HWCM9720	Hand auger (1 hole)	No significant deposits recorded	
HWCM 9721	Hand auger (2 holes)	No significant deposits recorded	
HWCM9722	Hand auger (6 holes)	No significant deposits recorded	
HWCM 9723	Hand auger (13 holes)	3 environmental samples	
HWCM 9724	Hand auger (4 holes)	1 environmental sample	
HWCM 9725	No fieldwork		
HWCM9726	Hand auger (2 holes)	No significant deposits recorded	
HWCM 9727	Hand auger (4 holes)	No significant deposits recorded	
HWCM 9728	No fieldwork		
HWCM 9729	Hand auger (6 holes) Earthwork survey	1 environmental sample Ridge and furrow recorded	8534

Overall site no	Fieldwork	Results	Detail no
Holmer section			
HWCM 9084	Fieldwalk (4 transects)	Medieval and post-medieval finds	9084
HWCM9229	No fieldwork		
HWCM 8531	Earthwork survey	Ridge and furrow recorded	
HWCM 9085	Fieldwalk (5 transects)	2 Roman sherds	9085
		Medieval and post-medieval finds	9142
HWCM 6026	Fieldwalk (10 transects) Fieldwalk (160 grids) Test trench (4 5x2m hand trenches)	Flints (both neolithic and Bronze Age represented): 31 flakes, 3 scrapers, 4 ?scrapers, 1 end scraper, 2 thumbnail scrapers, 2 blades, 1 retouched blade, 1 arrowhead/projectile point, 1 barb-and-tang arrowhead, 1 polished flint axe fragment	9143
		5 ?Iron Age sherds	9447
		60 Roman sherds	9144
		Medieval and post-medieval finds	9145
		Other finds include: 3 fired clay ?counters, 1 green glazed floor tile fragment, 1 iron buckle, 2 copper alloy buckles, 3 whetstones. Most of these are probably post-medieval.	
		The test trenches revealed no significant archaeological features.	
		Cropmarks (probably associated with field drains and other modern features)	
HWCM6027	Fieldwalk (12 transects)	1 flint scraper and 2 flakes	9146
		Medieval and post-medieval finds (including 1 silver coin of Elizabeth I)	9148
		Cropmarks (not on road line)	
HWCM9730	Hand auger (1 hole)	No significant deposits recorded	
HWCM 9731	Hand auger (2 holes)	No significant deposits recorded	
HWCM 9732	Hand auger (2 holes)	No significant deposits recorded	
HWCM 9733	No fieldwork		
HWCM 9734	Hand auger (4 holes)	No significant deposits recorded	
HWCM 9735	Hand auger (1 hole)	No significant deposits recorded	
HWCM9736	Hand auger (2 holes)	No significant deposits recorded	
HWCM 9737	Hand auger (2 holes)	No significant deposits recorded	
HWCM 9738	Hand auger (4 holes)	No significant deposits recorded	
		Possible cropmarks	9088
HWCM 9086	Fieldwalk (2 transects)	2 Roman sherds	9149
		Medieval and post-medieval finds	9150
HWCM 9228	No fieldwork		
HWCM 9087	Fieldwalk (8 transects)	Medieval and post-medieval finds	9087

Appendix 2 Catalogue of archaeological sites in the study area

HWCM	Grid ref	Site name	Parish	Date	Associated nos
226	SO 54383973	Cropmarks	Hampton Bishop	Prehistoric	
382	SO 52344192	Herefordshire & Gloucestershire Canal	Holmer	Post-medieval	
547	SO 53623833	Rotherwas Chapel	Dinedor	Medieval	
548	SO 53583838	Rotherwas House	Dinedor	Post-medieval	
1216	SO 53524026	Barn, Lower House Farm	Hampton Bishop	Post-medieval	
3216	SO 51103715	St Peter, Bullinghope (old church)	Grafton	Medieval	
5559	SO 52604188	Roman road	Holmer/Hereford	Roman	
6026	SO 523423	Cropmarks	Holmer	Undated	9143,9144,9145,9447
6027	SO 521423	Cropmark enclosures	Holmer	Undated	9146,9148
6500	SO 537398	Axe and flints	Hampton Bishop	Neolithic	
6501	SO 536398	Axe and flints	Hampton Bishop	Neolithic	
6504	SO 510370	Flints	Grafton	Prehistoric	
6510	SO 5142	Spindlewhorl	Pipe & Lyde	Prehistoric	
7015	SO 516421	Cropmark enclosure	Holmer	Undated	
7016	SO 508425	Shrunken settlement, ridge and furrow	Holmer	Medieval	
7221	SO 51103714	Churchyard cross, Bullinghope	Grafton	Medieval	
8465	SO 52053700	Flints	Lower Bullingham	Bronze Age	9138,9139
8531	SO 526423	Ridge & furrow	Holmer	Medieval	
8534	SO 525418	Ridge & furrow	Hereford	Medieval	
8611	SO 487373	Flints	Haywood	Prehistoric	9102,9103
8612	SO 490372	Flint	Haywood	Prehistoric	9131,9445
8614	SO 498365	Flints	Grafton	Prehistoric	9132,9133
8615	SO 504362	Flint	Grafton	Prehistoric	9134,9135
8617	SO 508364	Pottery	Grafton	Medieval/Post-med	
8618	SO 512366	Flints	Grafton	Prehistoric	9136,9137
8619	SO 522371	Flints	Lower Bullingham	Prehistoric	9140,9141
8621	SO 484375	Pottery	Haywood	Roman	9100,9101
8708	SO 530418	Cropmark	Hereford	Undated	
9084	SO 526419	Pottery	Holmer	Medieval/Post-med	
9085	SO 525422	Pottery	Holmer	Roman	9142
9087	SO 506433	Pottery	Pipe & Lyde	Medieval	
9088	SO 511428	Cropmarks?	Holmer	Undated	
9089	SO 540398	Cropmarks?	Hampton Bishop	Undated	9446
9090	SO 534385	Cropmarks	Lower Bullingham	Post-medieval	
9093	SO 51123720	Court Farm	Grafton	Post-medieval	
9094	SO 51083706	Church Farm	Grafton	Post-medieval	
9096	SO 535402	Tupsley Court	Hampton Bishop	Post-medieval	
9097	SO 535402	Barn,Tupsley Court	Hampton Bishop	Post-medieval	
9098	SO 53554040	Lower House Farm	Hampton Bishop	Post-medieval	
9100	SO 484375	Flints	Haywood	Prehistoric	8621,9101
9101	SO 484375	Pottery	Haywood	Medieval/Post-med	8621,9100
9102	SO 487373	Pottery	Haywood	Roman	8611,9103
9103	SO 483373	Pottery	Haywood	Medieval/Post-med	8611,9102
9131	SO 490372	Pottery	Haywood	Medieval/Post-med	8612,9445
9132	SO 498365	Pottery	Grafton	Roman	8614,9133
9133	SO 498365	Pottery	Grafton	Medieval/Post-med	8614,9132
9134	SO 504362	Pottery	Grafton	Roman	8615,9135
9135	SO 504362	Pottery	Grafton	Medieval	8615,9134
9136	SO 512366	Pottery	Grafton	Roman	8618,9137
9137	SO 512366	Pottery	Grafton	Medieval/Post-med	8618,9136

HWCM	Grid ref	Site name	Parish	Date	Associated nos
9138	SO 52053700	Pottery	Lower Bullingham	Roman	8465,9139
9139	SO 52053700	Pottery	Lower Bullingham	Medieval/Post-med	8465,9138
9140	SO 522371	Pottery	Lower Bullingham	Roman	8619,9141
9141	SO 522371	Pottery	Lower Bullingham	Medieval/Post-med	8619,9140
9142	SO 525422	Pottery	Holmer	Medieval/Post-med	9085
9143	SO 523423	Flints	Holmer	Prehistoric	6026,9144,9145,9447
9144	SO 523423	Pottery	Holmer	Roman	6026,9143,9145,9447
9145	SO 523423	Pottery	Holmer	Medieval/Post-med	6026,9143,9144,9447
9146	SO 521423	Flints	Holmer	Prehistoric	6027,9147,9148
9148	SO 521423	Pottery	Holmer	Medieval/Post-med	6027,9146
9149	SO 508431	Pottery	Pipe & Lyde	Roman	9150
9150	SO 508431	Pottery	Pipe & Lyde	Medieval/Post-med	9149
9216	SO 532410	Lugg Meadows	Lugwardine	Medieval	
9410	SO 49103715	Hereford Tramway	Haywood	Post-medieval	
9412	SO 52184226	Shrewsbury & Hereford Railway	Holmer	Post-medieval	
9413	SO 49263706	Newport, Abergavenny & Hereford Rly	Haywood	Post-medieval	
9414	SO 517418	Victoria tile works	Hereford	Post-medieval	
9415	SO 516420	Jubilee Cider Works	Hereford	Post-medieval	
9419	SO 503362	Poss Roman road, Hereford-Monmouth	Grafton	Roman	
9425	SO 53613829	Barn, Rotherwas	Dinedor	Post-medieval	
9426	SO 53593829	Stable block, Rotherwas	Dinedor	Post-medieval	
9427	SO 50983706	St Peter, Bullinghope (new church)	Grafton	Post-medieval	
9428	SO 50993706	Stone coffin lid	Grafton	Medieval	
9429	SO 51543693	Barn, Green Crize Farm	Lower Bullingham	Post-medieval	
9430	SO 48223815	Church, Belmont Abbey	Clehonger	Post-medieval	
9431	SO 482381	Monastic buildings, Belmont Abbey	Clehonger	Post-medieval	
9432	SO 48633721	Merryhill Farmhouse	Haywood	Post-medieval	
9433	SO 48633723	Stables, Merryhill Farm	Haywood	Post-medieval	
9434	SO 50784243	Copelands	Holmer	Post-medieval	
9435	SO 50524257	Holmer House	Holmer	Post-medieval	
9436	SO 53724033	Milepost	Hampton Bishop	Post-medieval	
9437	SO 53443998	Meadow Cottage, Tupsley	Hampton Bishop	Post-medieval	
9438	SO 53543835	Earthworks, Rotherwas	Dinedor	Medieval/Post-med	
9439	SO 53403821	Pond, Rotherwas	Dinedor	Medieval/Post-med	
9445	SO 490372	Pottery	Haywood	Roman	8612,9131
9446	SO 540398	Flints	Hampton Bishop	Prehistoric	9089
9447	SO 523423	Pottery	Holmer	?Iron Age	6026,9143,9144,9145
9448	SO 48663800	Belmont Pool	Clehonger/Hereford	Medieval/Post-med	
9450	SO 530424	Ridge & furrow	Holmer	Medieval/Post-med	

Appendix 3 Archive

The archive consists of:

13	Context records AS1
23	Fieldwork progress records AS2
433	Context finds sheets AS8
70	Finds catalogue sheets
18	Field record sheets
149	Transect record sheets
155	Auger record sheets
3	Boxes of finds
1	Box of soil samples

All primary records and finds are kept at:

Archaeology Section
Hereford and Worcester County Council
Tetbury Drive
Warndon
Worcester WR4 9LS

Tel Worcester (0905) 58608

A security copy of the archive has been placed at:

Hereford and Worcester County Museum
Hartlebury Castle
Hartlebury
Near Kidderminster
Worcestershire DY11 7XZ

Tel Hartlebury (0299) 250416

Appendix 4: Extract from Criteria for the scheduling of ancient monuments (DoE 1983)

1) Survival/condition: the survival of the monument's archaeological potential both above and below ground is a crucial consideration and needs to be assessed in relation to its present condition and surviving features.

2) Period: it is important to consider for preservation all types of monuments that characterise a category or period.

3) Rarity: there are some monument categories which in some periods are so scarce that all of them which still retain any archaeological potential should be preserved. In general, however a selection must be made which portrays the typical and commonplace as well as the rare. For this, account should be taken of all aspects of the distribution of a particular class of monument not only in the broad national context but also in its region.

4) Fragility/vulnerability: highly important archaeological evidence from some field monuments can be destroyed by a single ploughing or unsympathetic treatment; these monuments would particularly benefit from the statutory protection which scheduling confers. There are also standing structures of particular form or complexity where again their value could be severely reduced by neglect or careless treatment and which are well suited to protection by this legislation even though they may also be listed historic buildings.

5) Diversity: some monuments have a combination of high quality features - others are chosen for a single important attribute.

6) Documentation: the significance of a monument may be given greater weight by the existence of records of previous investigation or, in the case of more recent monuments, by the support of contemporary written records.

7) Group value: the value of a single monument (such as a field system) is greatly enhanced by association with a group of related contemporary monuments (such as a settlement and cemetery) or with monuments of other periods. In the case of some groups it is preferable to protect the whole including the associated and adjacent land rather than to protect isolated monuments within the group.

8) Potential: on occasion the nature of the evidence cannot be precisely specified but it is possible to document reasons for anticipating probable existence and importance and so demonstrate the justification for scheduling. This is usually confined to sites rather than upstanding monuments.

Key to conventions used on map overlays

Fieldwork (2-6B)

Fieldwalking

Auger holes

Ridge and furrow recorded

Archaeological sites (2-6C)

Sites registered on SMR

Recommendations (2-6E)

Priority areas for monitoring

Scheduled ancient monuments

Fig 2A A465/A49 (Grafton) Section

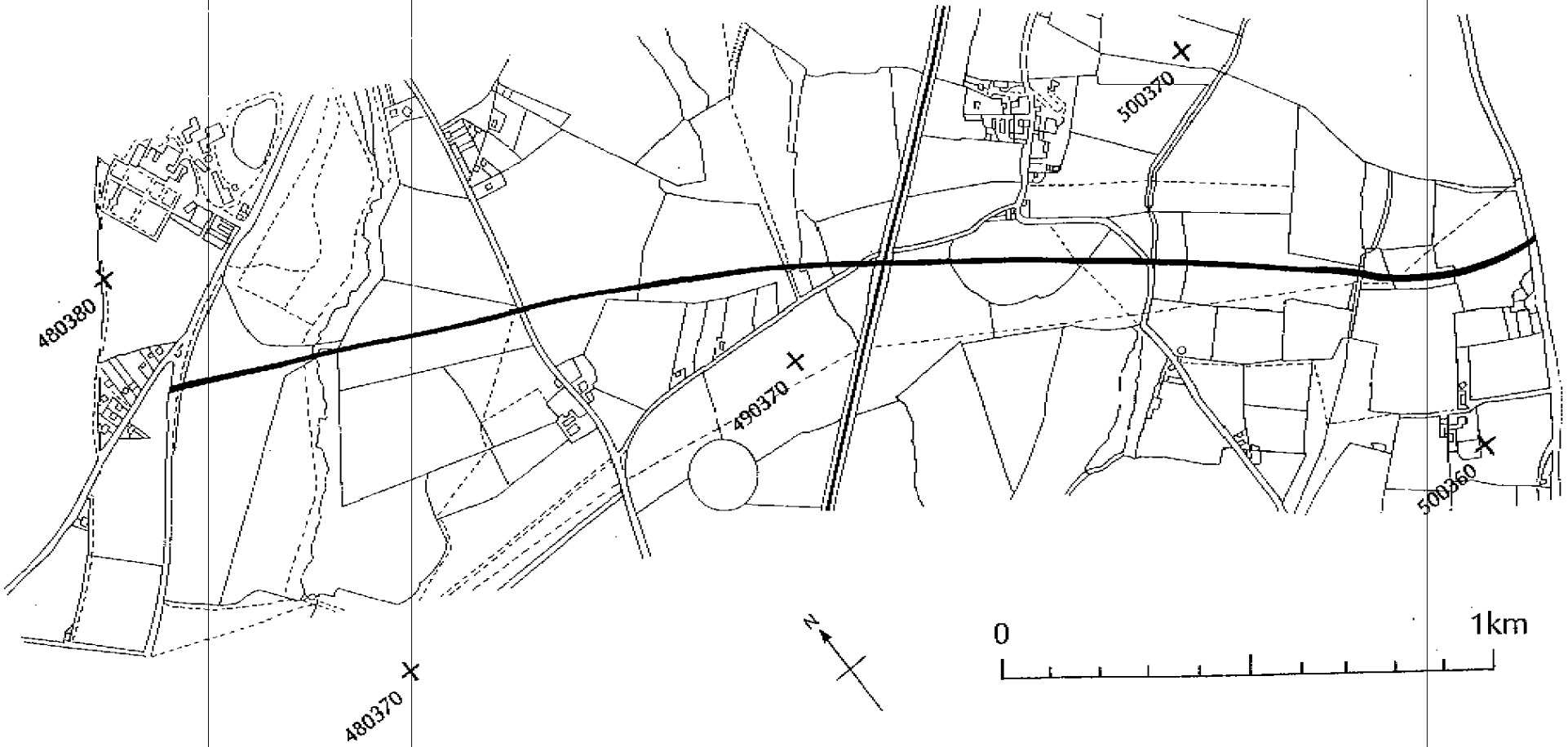


Fig 3A Bullingham Section

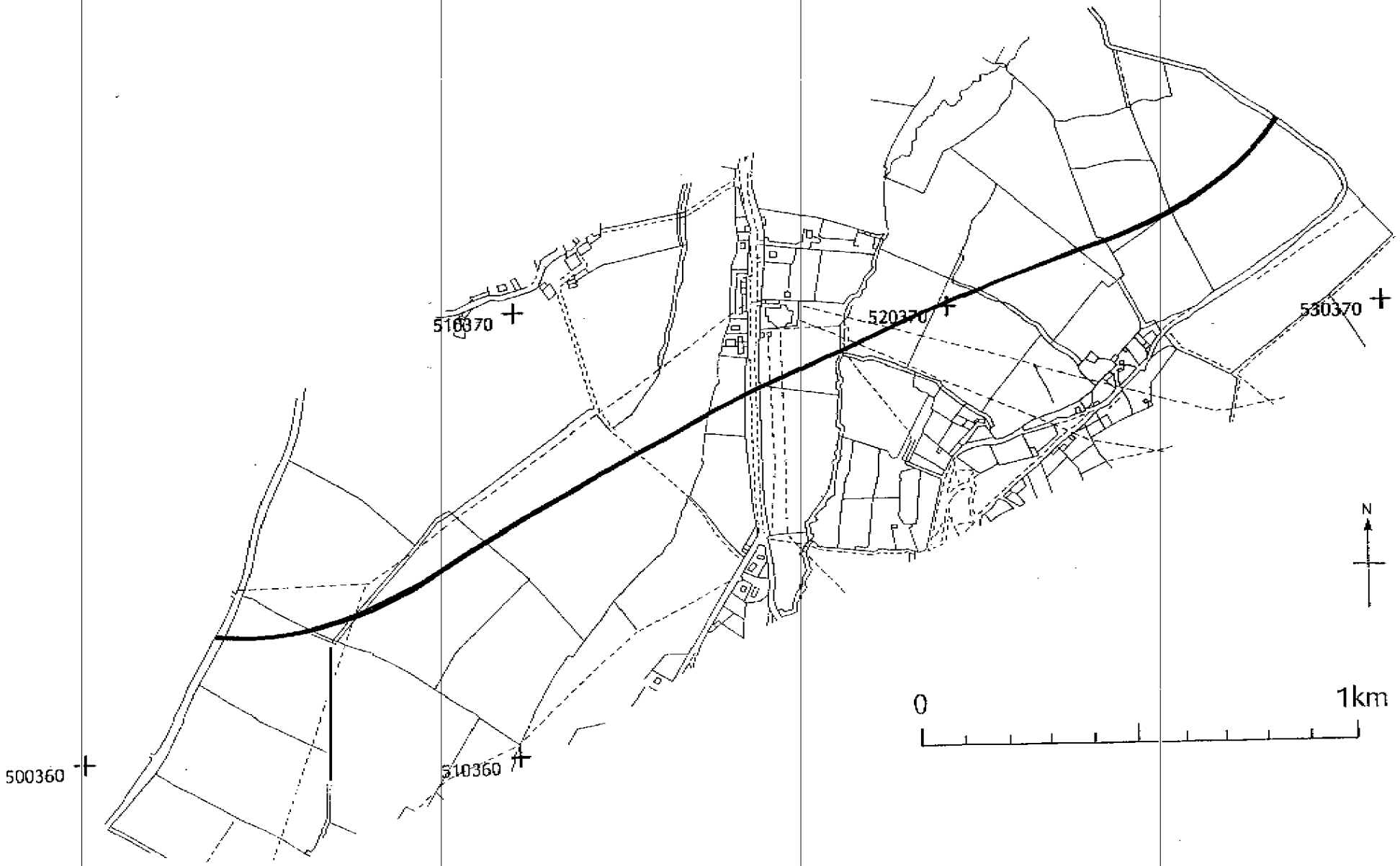


Fig 4A Rotherwas Section

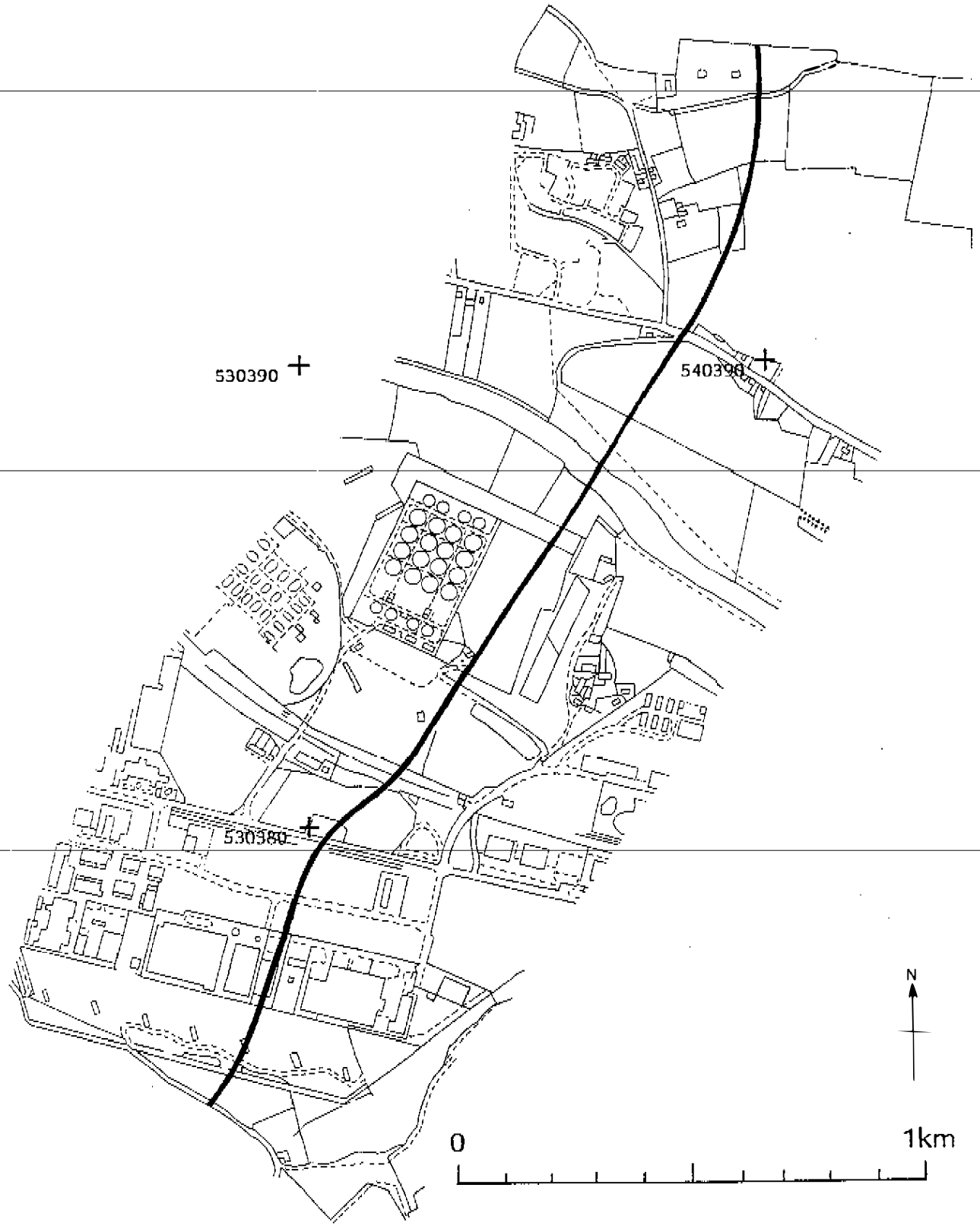


Fig 5A Lugg Section

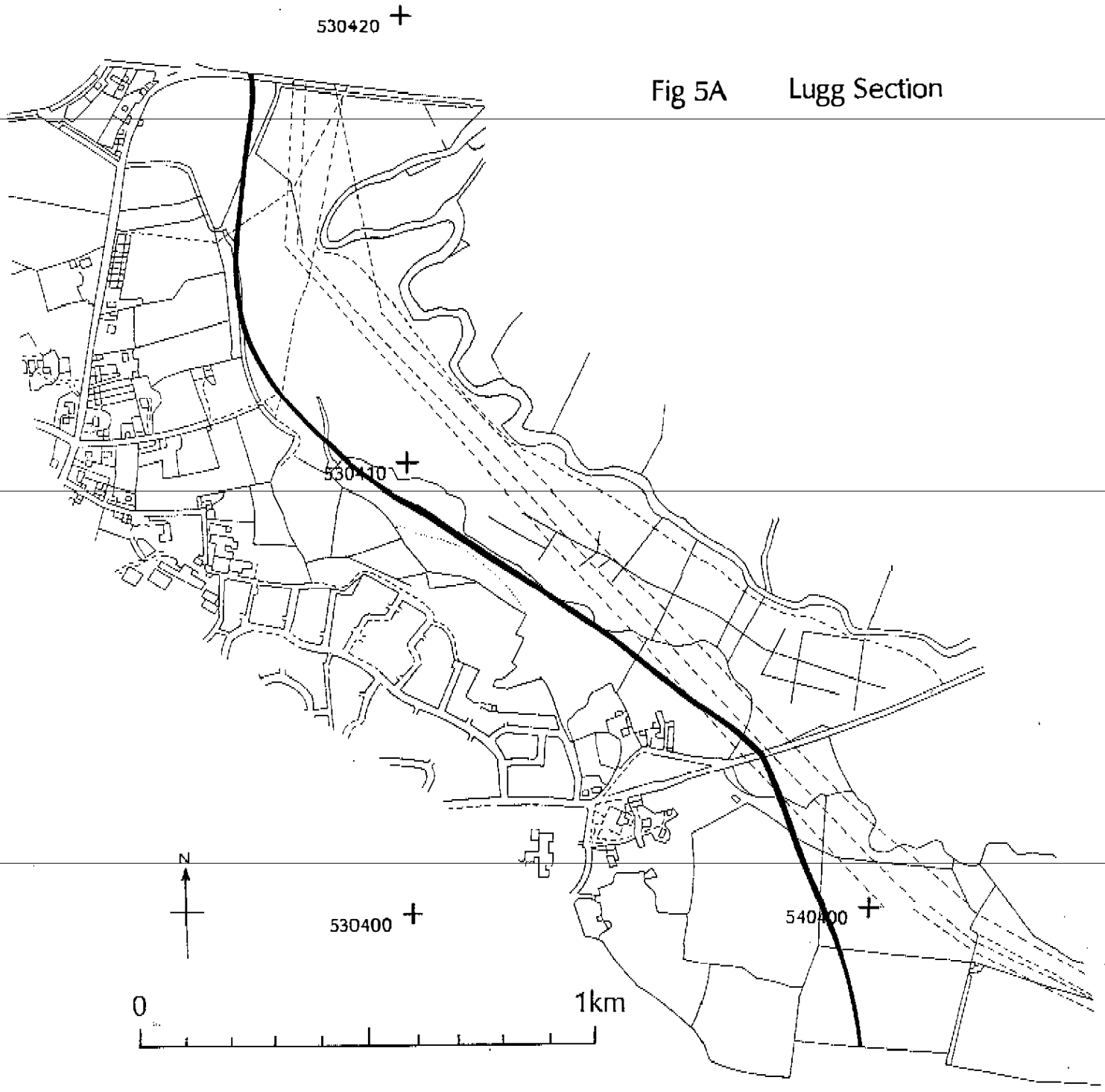
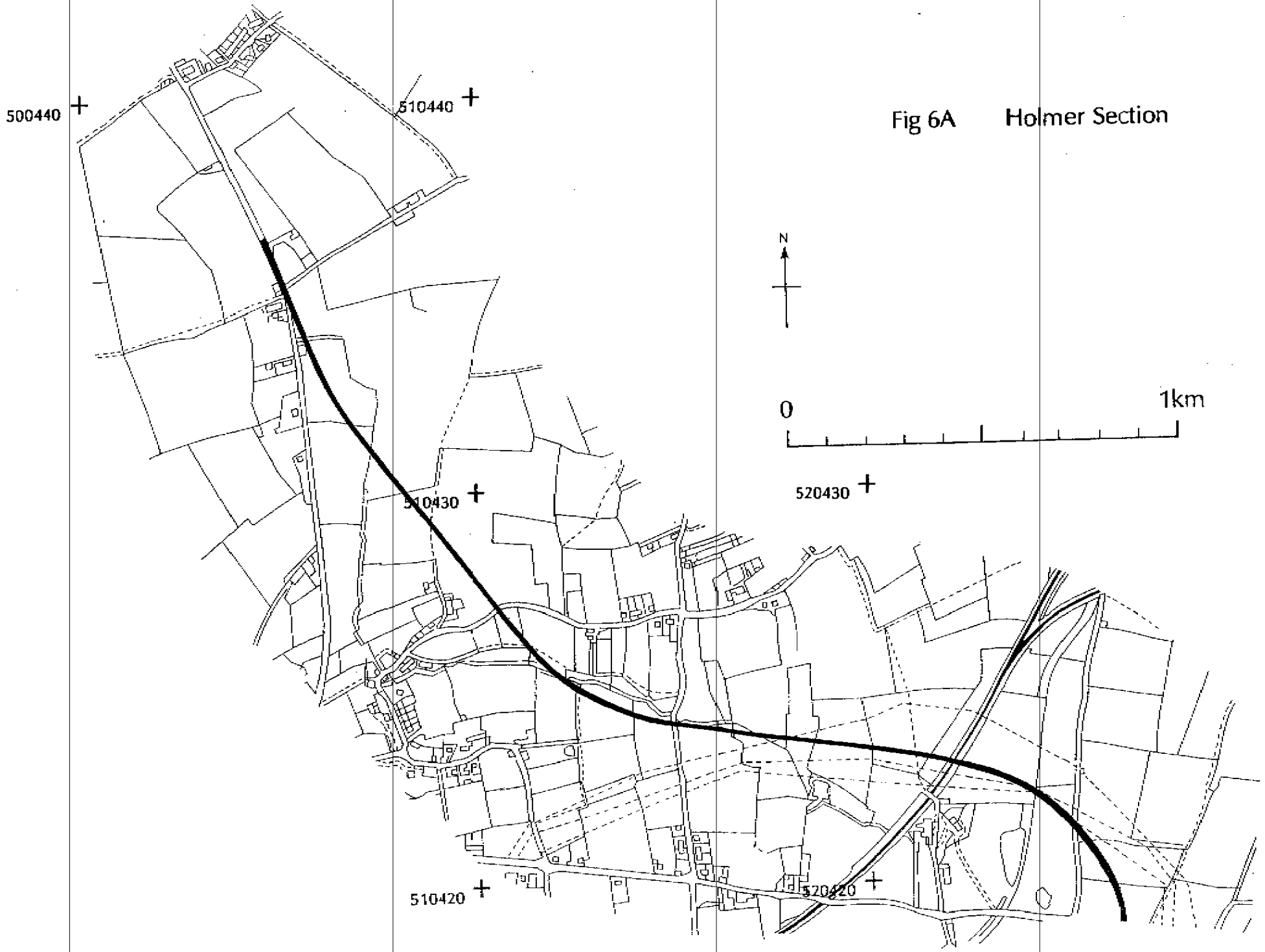


Fig 6A Holmer Section



HEREFORD BYPASS:

ARCHAEOLOGICAL EVALUATION

REPORT 45

Map overlays

PHOTOCOPY ONTO
TRANSPARENT FILM
AS REQUIRED.

Fig 2B

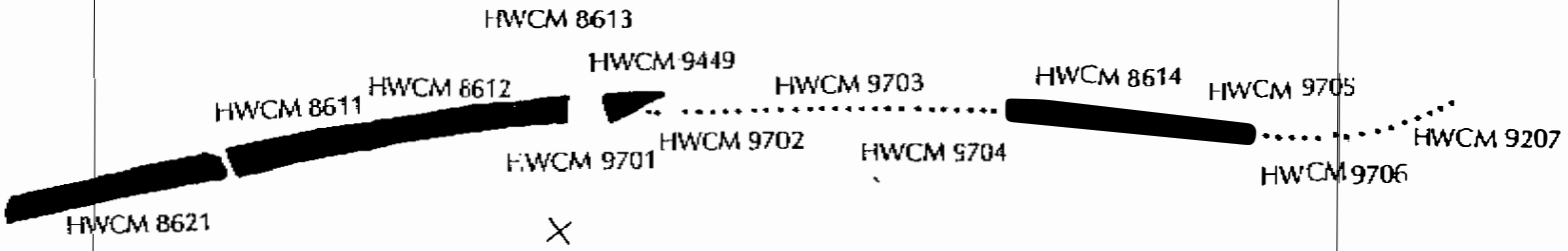

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Fig 3B

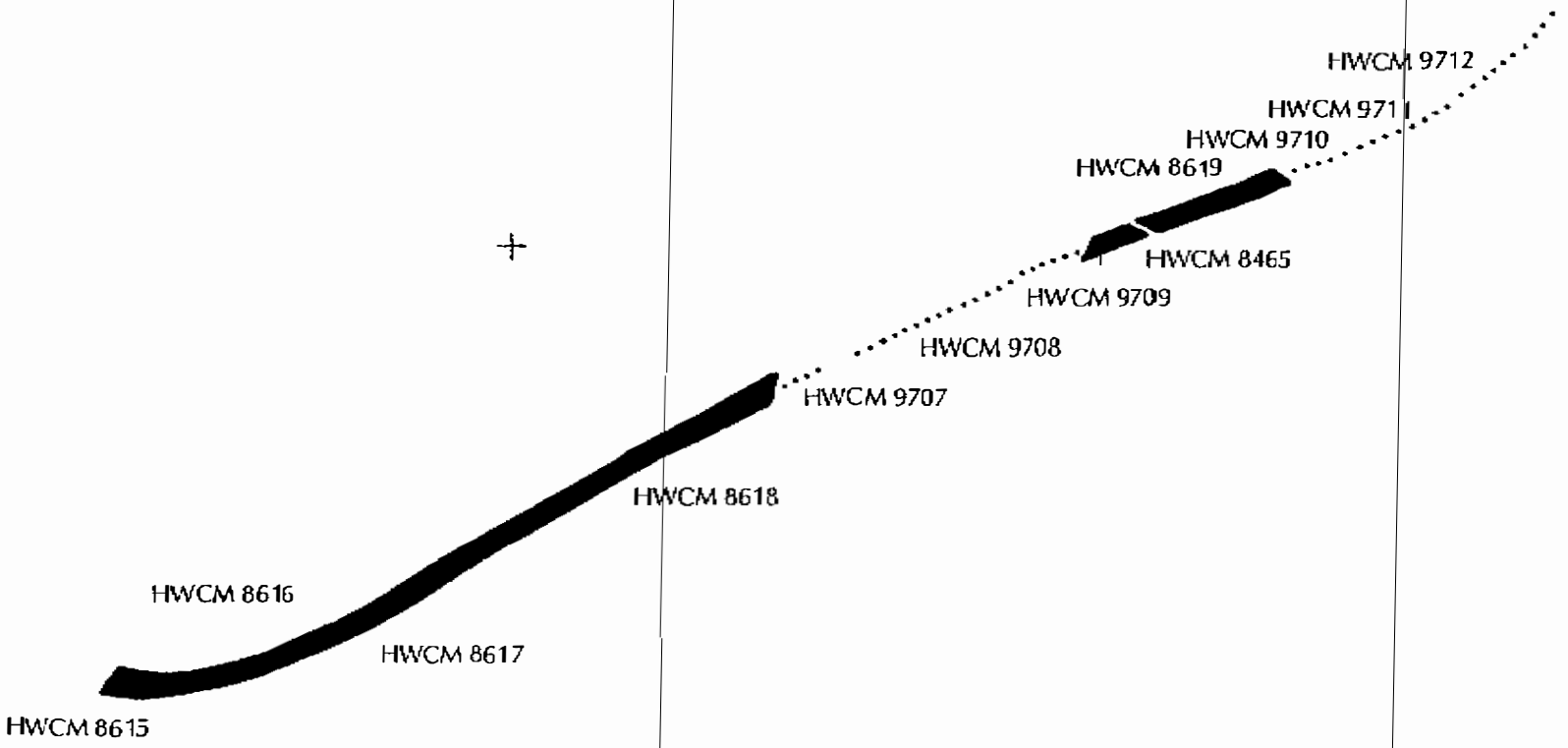
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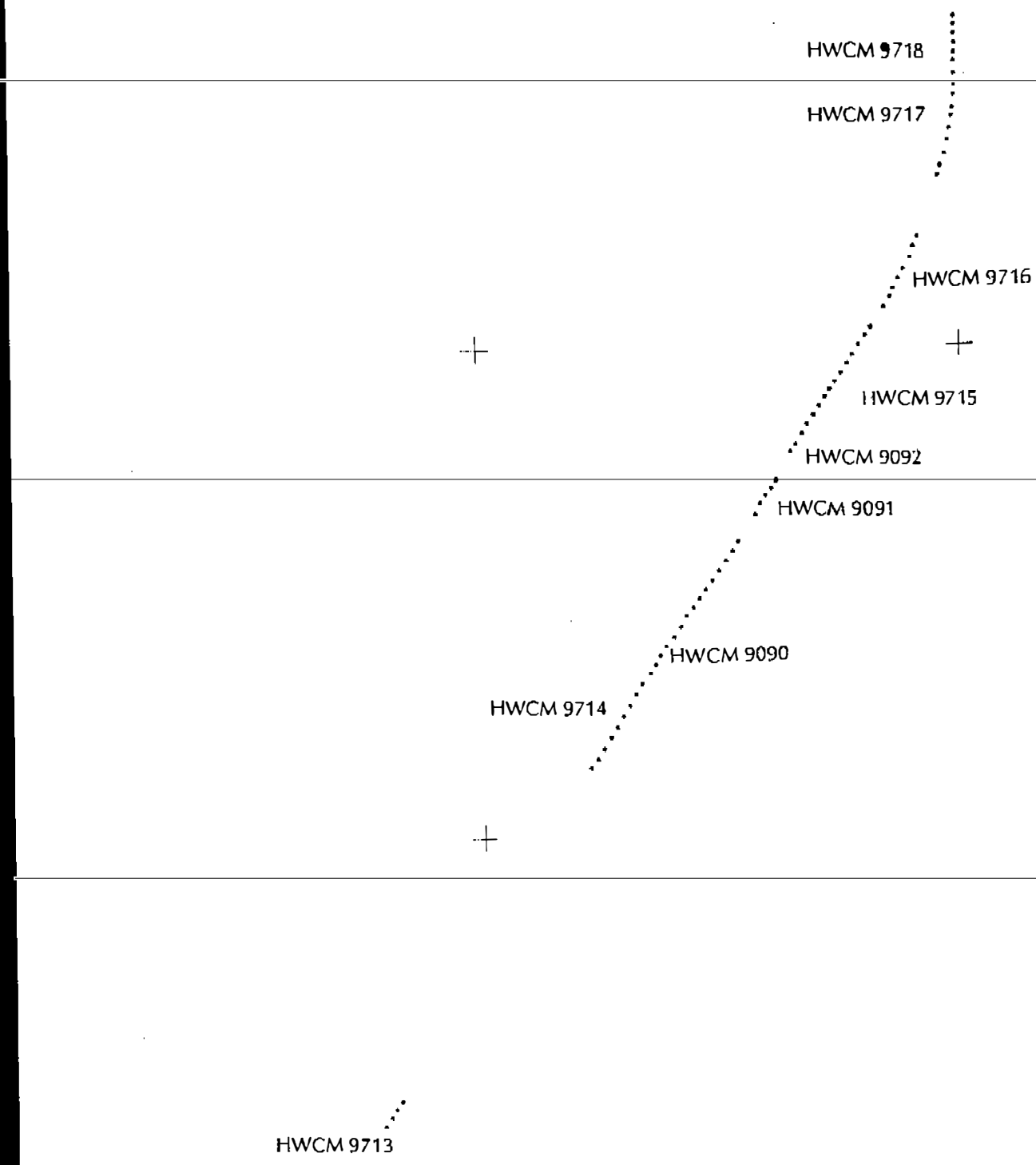
Fig 4B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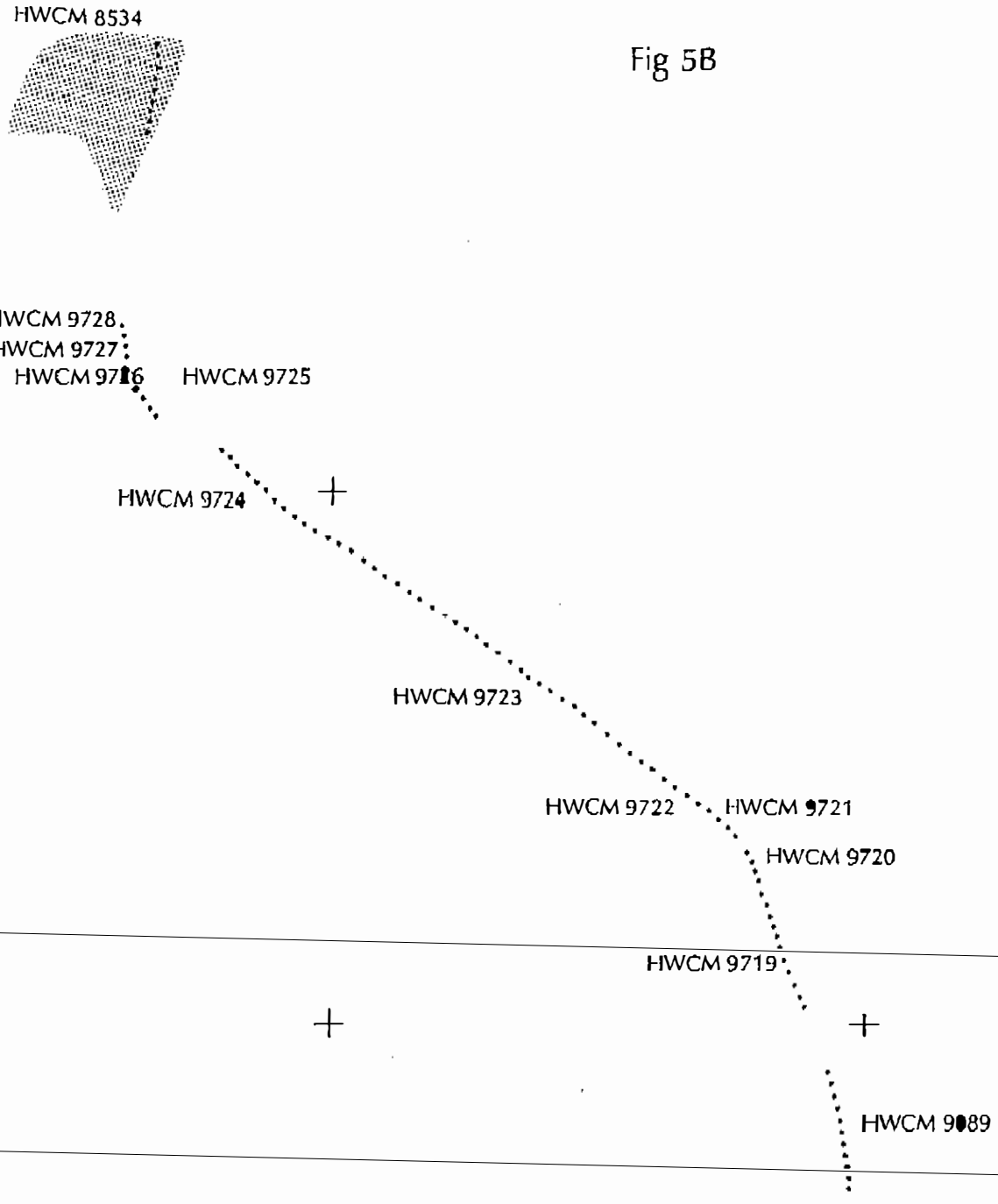
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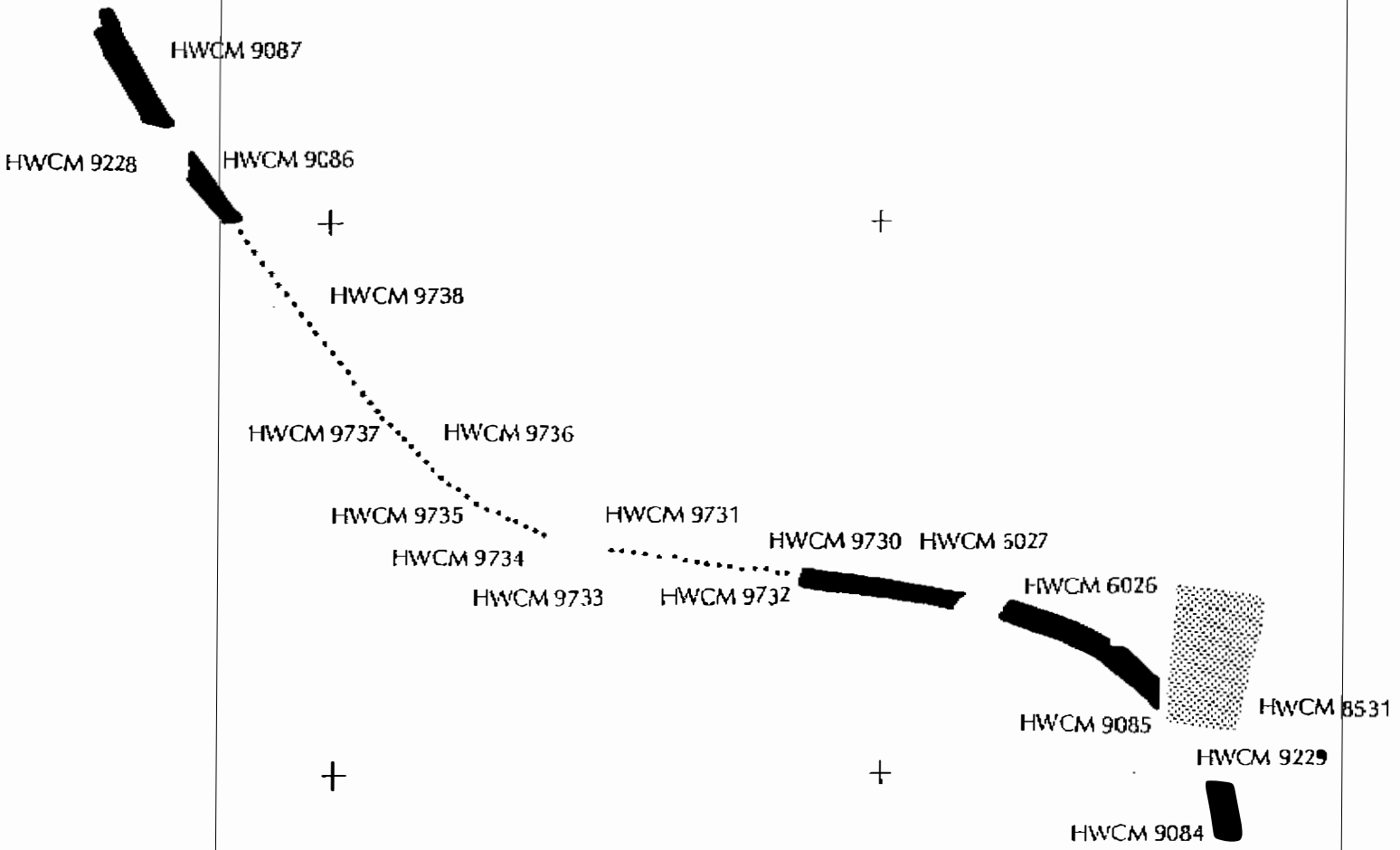
HWCM 9720
HWCM 9719
HWCM 9089

Fig 5B

Fig 6B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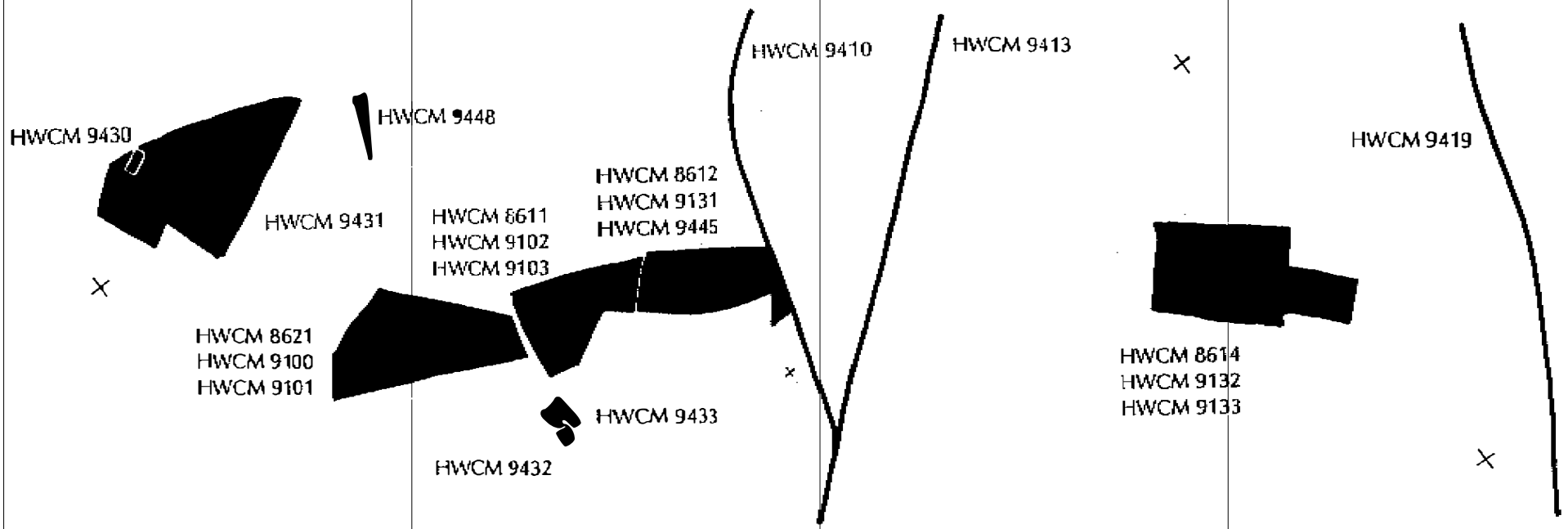
HWCM 9738
HWCM 9737
HWCM 9736
HWCM 9735
HWCM 9731
HWCM 9734
HWCM 9730
HWCM 5027
HWCM 9733
HWCM 9732
HWCM 6026
HWCM 9085
HWCM 8531
HWCM 9229
HWCM 9084

Fig 2C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HWCM 9419
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HWCM 9102
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HWCM 9100
HWCM 9101
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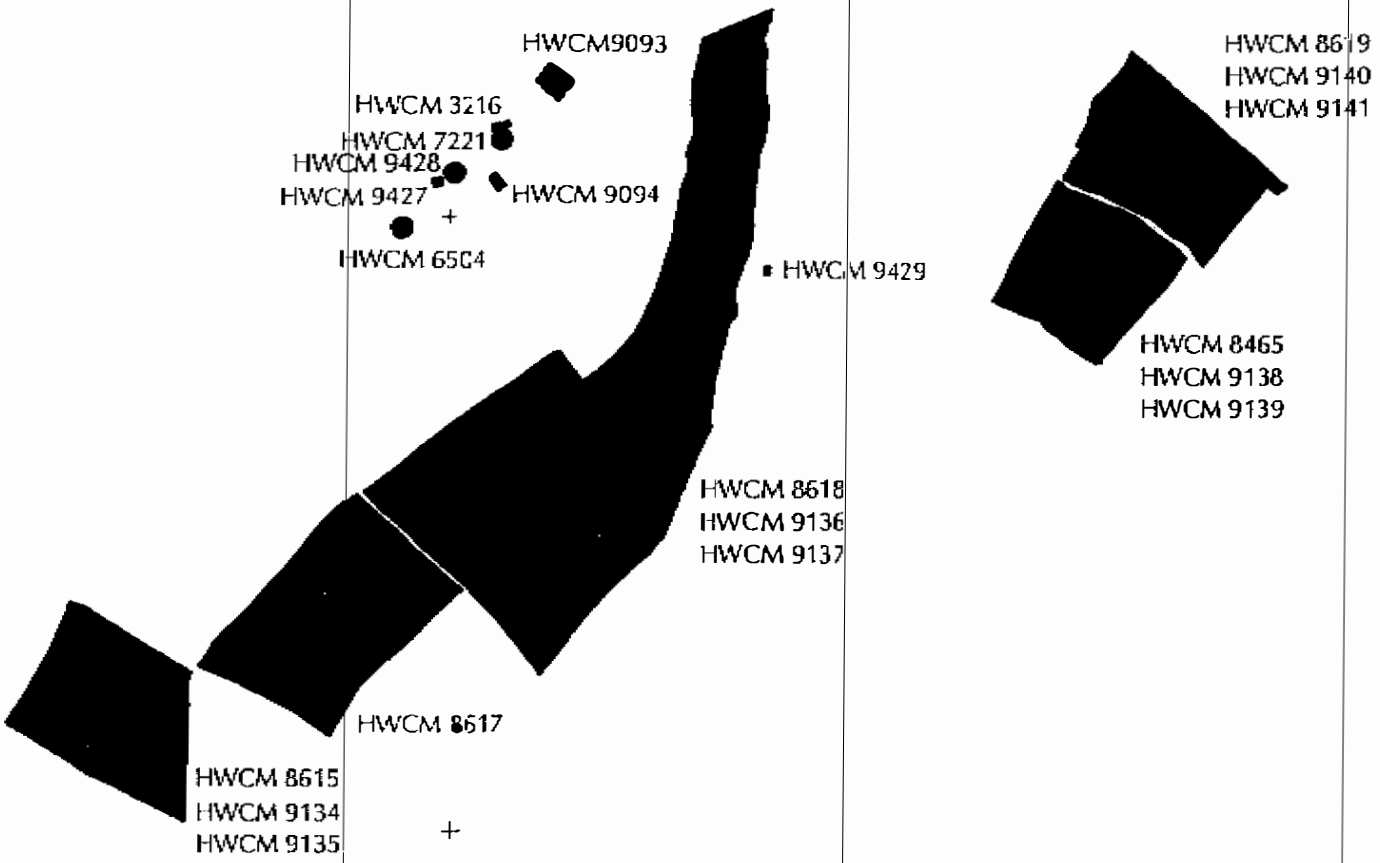
HWCM 9132
HWCM 9133
HWCM 9433
HWCM 9432

Fig 3C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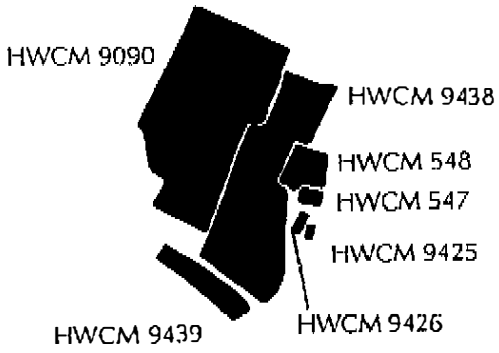
HWCM 3216
HWCM 7221
HWCM 9428
HWCM 9427
HWCM 9094
HWCM 6504
HWCM 9429
HWCM 8619
HWCM 9140
HWCM 9141
HWCM 8465
HWCM 9138
HWCM 9139
HWCM 8618
HWCM 9136
HWCM 9137
HWCM 8617
HWCM 8615
HWCM 9134
HWCM 9135

Fig 4C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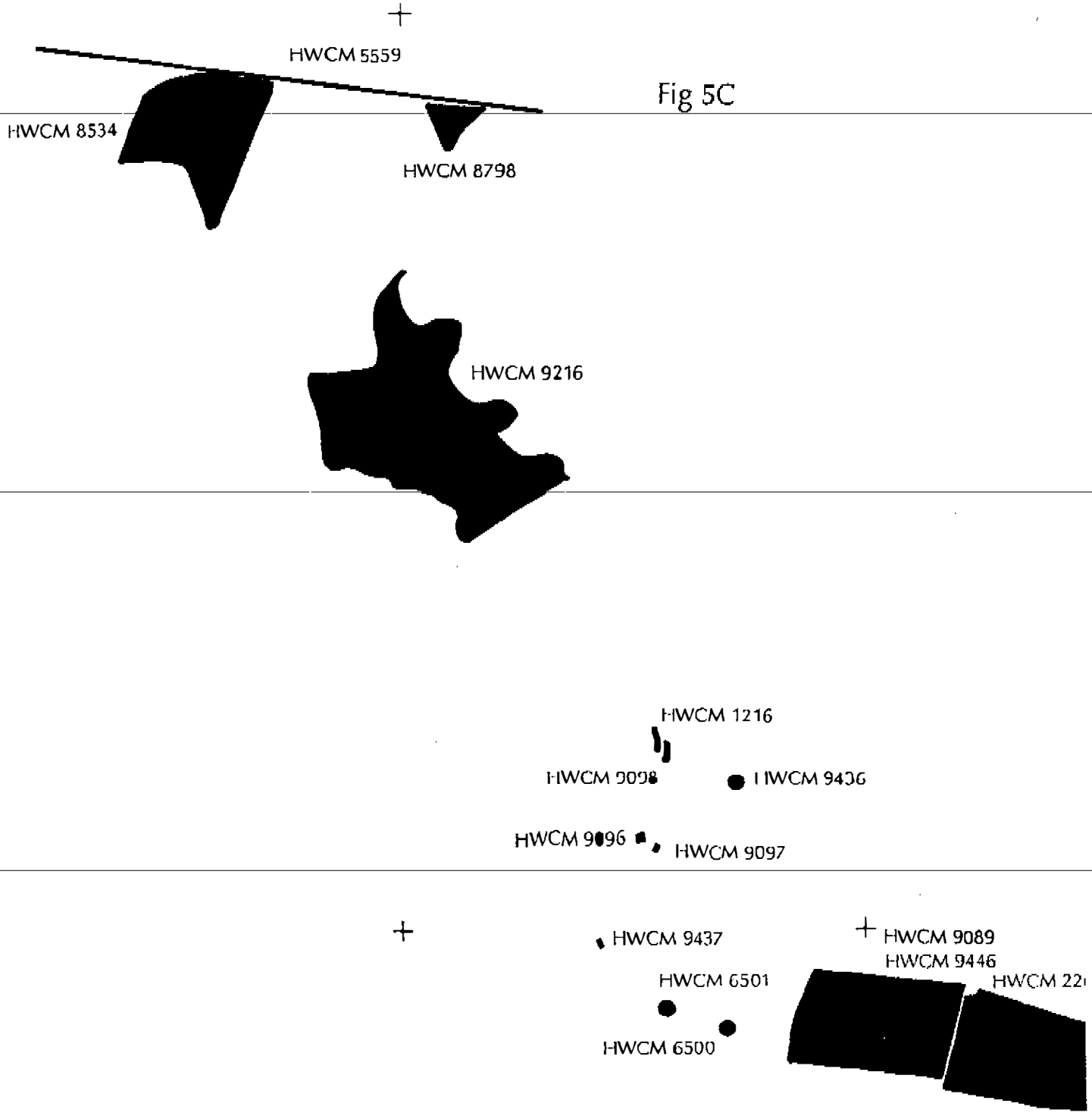
HWCM 9438
HWCM 548
HWCM 547
HWCM 9425
HWCM 9426
HWCM 9439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HWCM 8534
HWCM 8798
HWCM 9216
HWCM 1216
HWCM 9098
HWCM 9436
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HWCM 9097
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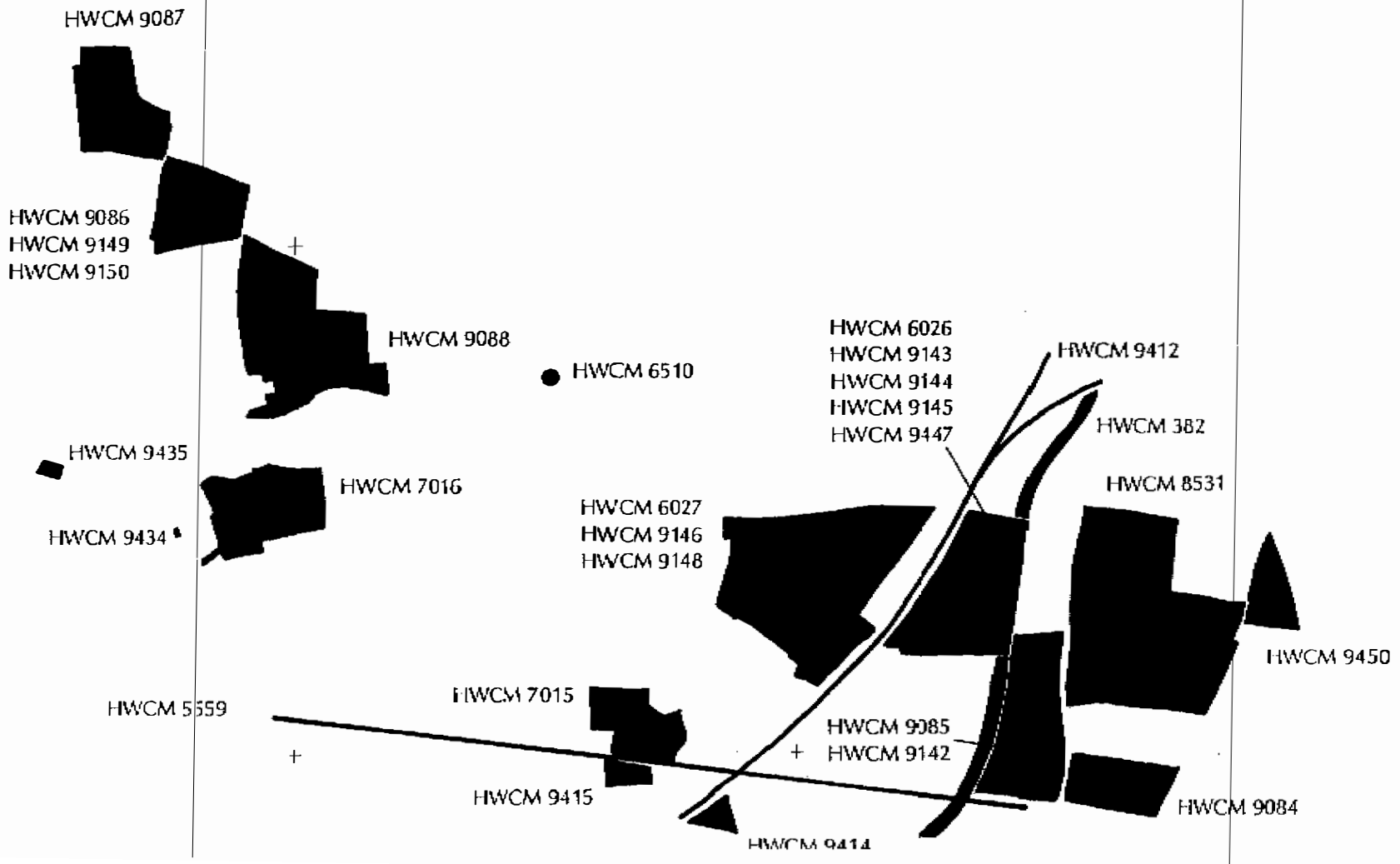
HWCM 9089
HWCM 9446
HWCM 6501
HWCM 6500

Fig 5C

Fig 6C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HWCM 9086
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HWCM 9435
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HWCM 9143
HWCM 9144
HWCM 9145
HWCM 9447
HWCM 9412
HWCM 382
HWCM 8531
HWCM 6027
HWCM 9146
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HWCM 9450
HWCM 5559
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HWCM 9085
HWCM 9142
HWCM 9415
HWCM 9084
HWCM 9414

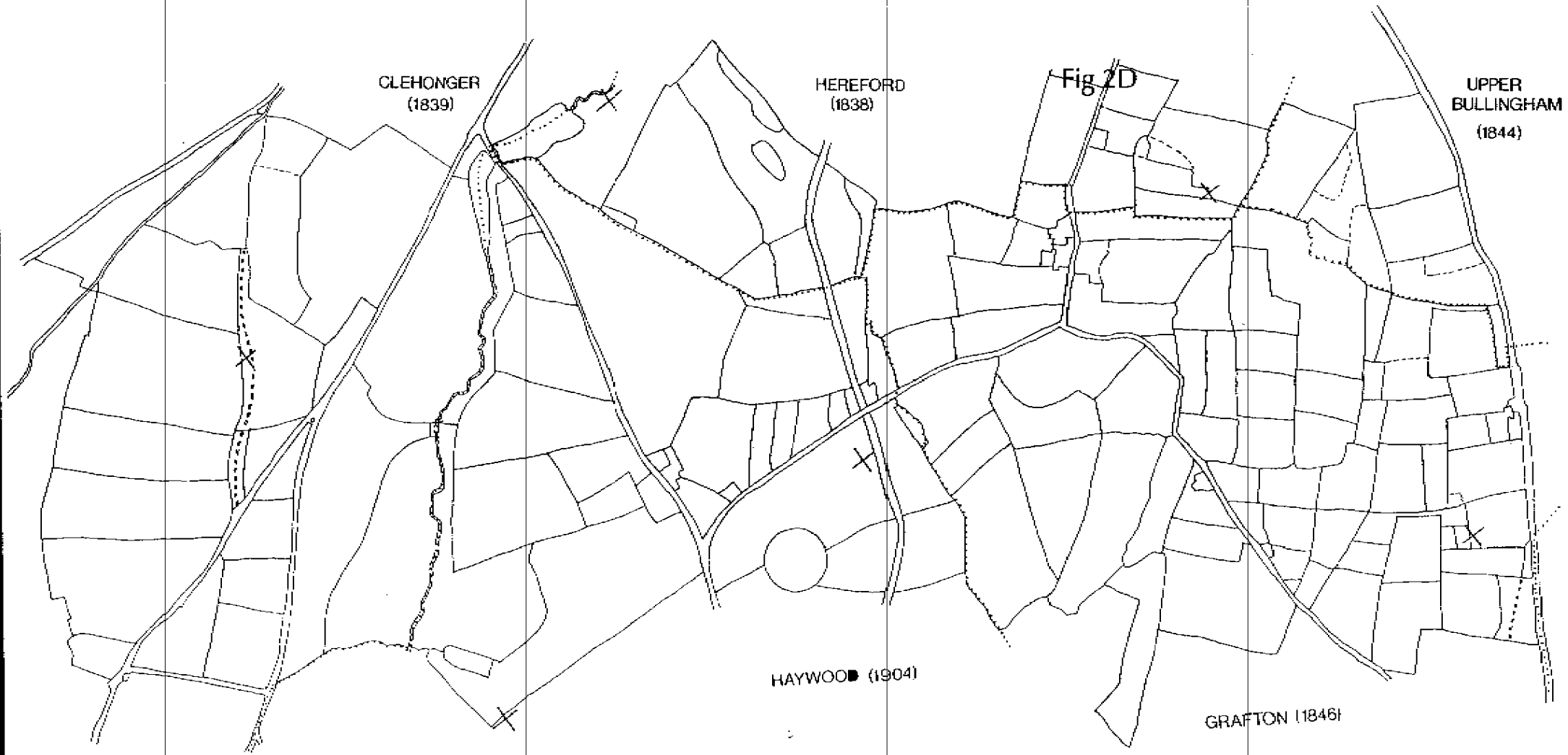
CLEHONGER
(1839)
HEREFORD
(1838)
UPPER
BULLINGHAM
(1844)
HAYWOOD (1904)
GRAFTON (1846)

Fig 2D

Fig 3D

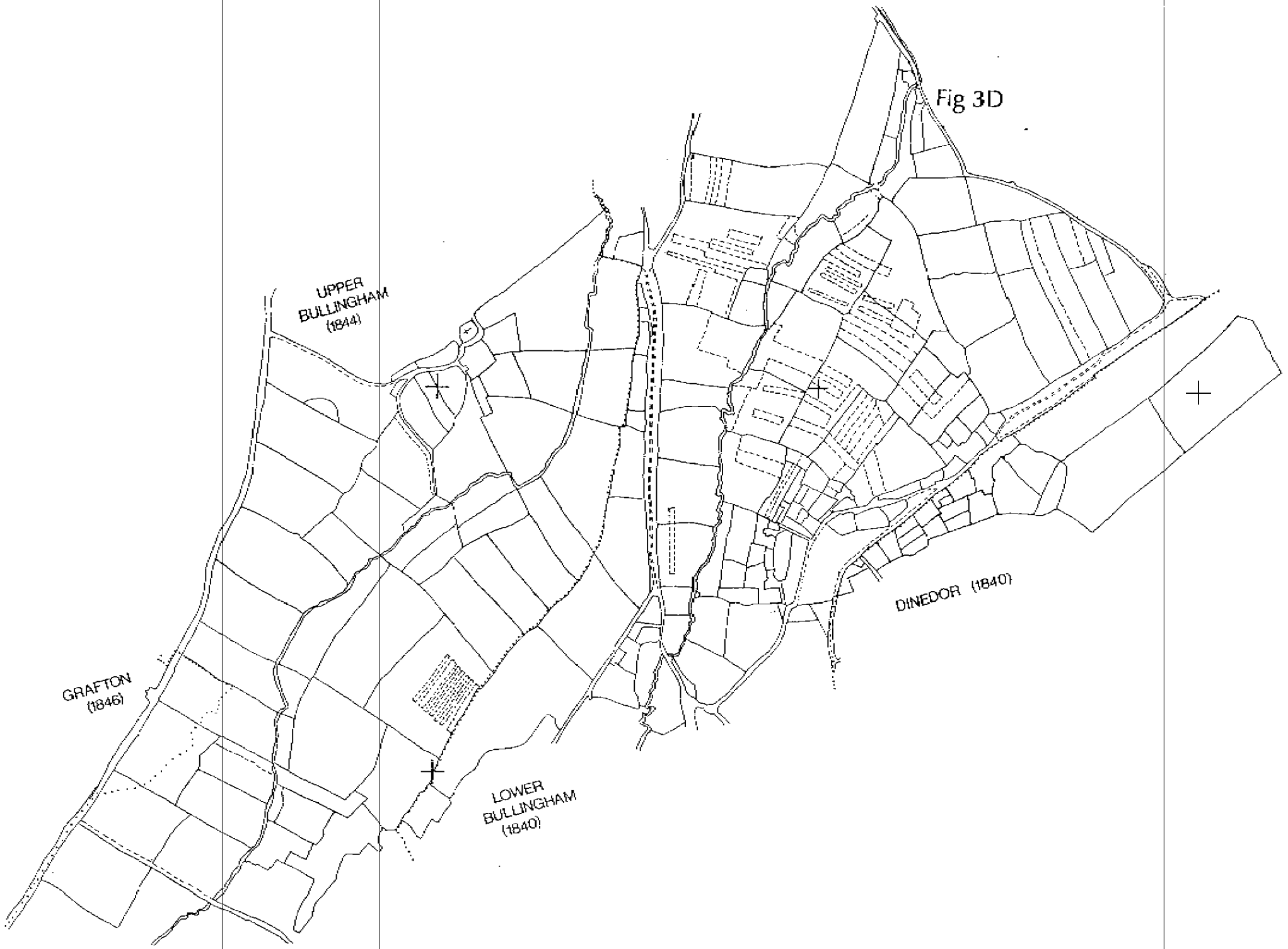
UPPER
BULLINGHAM
(1844)
GRAFTON
(1846)
LOWER
BULLINGHAM
(1840)
DINEDOR (1840)

Fig 4D

Fig 6D