



Northamptonshire County Council

Northamptonshire Archaeology

Geophysical survey, archaeological trial trenching,
and watching brief on geotechnical test pits at
Junction 10A of the M1, Luton Bedfordshire

September 2009

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OAS/S REPORT FORM

PROJECT DETAILS		
Project name	M1 Junction 10A	
Northamptonshire Archaeology carried out archaeological geophysical survey, trial trenching, and a watching brief of geotechnical test pits, on land proposed for improvements to Junction 10A of the M1 motorway, Luton, Bedfordshire. The geophysical survey identified a single possible feature. The trenching identified a single post-medieval gully and a small number of undated features comprising a ditch, two gullies and a pit. Post-medieval brick and an iron nail were recovered from one of the gullies. A rumbler bell and an iron disk were recovered from the topsoil by metal detection. A single gully was identified in one geotechnical test pit. A brickearth deposit was identified in one test pit.		
Project type	Geophysical survey, archaeological trial trenching and watching brief	
Site status	None	
Previous work	None	
Current Land use	Stubble and pasture	
Future work	Unknown	
Monument type/period	Ditch, gullies and pit, all undated	
Significant finds	None	
PROJECT LOCATION		
County	Bedfordshire	
Site address	Newlands Farm, Newlands Road, Luton, Bedfordshire	
Study area	c22ha	
OS Easting & Northing	TL 091 188	
Height OD	160mOD - 140mOD	
PROJECT CREATORS		
Organisation	Northamptonshire Archaeology	
Project brief originator	Bedfordshire County Council	
Project Design originator	Scott Wilson Ltd	
Director/Supervisor	Anne Foard-Colby/Ian Fisher	
Project Manager	Mark Holmes/Antony Walsh/Adrian Butler	
Sponsor or funding body	Scott Wilson Ltd	
PROJECT DATE		
Start date	24 August 2009	
End date	23 September 2009	
ARCHIVES		
	Location	Content
Physical	LUTNM:2009.122	1 archive box of site documents, 1 archive box of brick, fired clay and metal small finds
Paper		
Digital		1 CD of digital images, report and mapping files
BIBLIOGRAPHY		
Journal/monograph, published or forthcoming, or unpublished client report (NA report)		
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**GEOPHYSICAL SURVEY, ARCHAEOLOGICAL TRIAL TRENCHING,
AND WATCHING BRIEF ON GEOTECHNICAL TEST PITS AT
JUNCTION 10A OF THE M1
LUTON, BEDFORDSHIRE
SEPTEMBER 2009**

Abstract

Northamptonshire Archaeology carried out archaeological geophysical survey, trial trenching and a watching brief of geotechnical test pits, on land proposed for improvements to Junction 10A of the M1 motorway, Luton, Bedfordshire. The geophysical survey identified a single possible feature. The trenching identified a single post-medieval gully and a small number of undated features comprising a ditch, two gullies and a pit. Post-medieval brick and an iron nail were recovered from one of the gullies. A rumbler bell and an iron disk were recovered from the topsoil by metal detection. A single gully was identified in one test pit. A brickearth deposit was identified in one test pit.

1 INTRODUCTION

Archaeological geophysical survey, trial trenching, and a watching brief on geotechnical test pits was carried out by Northamptonshire Archaeology during August and September 2009 on land at Junction 10A of the M1, Luton Bedfordshire (Fig 1; NGR TL 091 188).

The work was undertaken in order to inform a planning application for works in advance of proposed grade separation improvement to the junction. The archaeological geophysical survey and trial trenching met the requirements of a specification issued by Scott Wilson, July 2009 and the watching brief of geotechnical test pits was agreed in a method statement, September 2009, both approved by Luton Borough Council Archaeological Advisor.

Northamptonshire Archaeology were commissioned by Scott Wilson, acting on behalf of Luton Borough Council, to undertake the archaeological geophysical survey, trial trenching and a watching brief to determine whether archaeological remains survived within the proposed development area.

2 BACKGROUND

2.1 Topography and geology

Junction 10A is situated 1km to the east of Junction 10 of the M1 motorway and to the south of Luton, Bedfordshire (Fig 1).

The site occupies c22ha of arable and pasture land, which slopes to the south-west from 160mOD to 140mOD. To the north of Junction 10A is Kidney Wood and to the north-east Bulls Wood, both remnants of ancient woodland. Luton Hoo, a registered historic park lies to the east.

The solid geology comprises cretaceous chalk of the Chiltern dip slope with superficial deposits comprising clay with flints. Also recorded are solution features in the Chalk,

which contains brickearth in the immediate vicinity west of Junction 10A (BGS GeolIndex).

2.2 Archaeological and historical background

The archaeological and historical background of the development site was discussed in the Written Scheme of Investigation (WSI) issued by Scott Wilson (2009), and is reproduced verbatim with permission of Scott Wilson in this section. The accompanying figure (Fig 2) was originally figure 3 in the WSI.

A number of previous archaeological investigations have been undertaken in the area surrounding Junction 10A and alongside the M1 motorway in advance of a proposed widening scheme and have included desk-based assessment, fieldwalking, geophysical survey and trial trench evaluations carried out by a number of professional archaeological units.

Archaeological investigation immediately adjacent to J10a comprised fieldwalking surveys carried out by the Manshead Archaeological Society in the 1990s and identified archaeological remains dating from the Mesolithic to the medieval period.

A preliminary assessment of baseline conditions has been undertaken and cultural heritage assets within a 1km radius of J10a mapped (Fig 2). The assessment comprised a review of existing National Monuments Record (NMR) and Bedfordshire and Luton Historic Environment Register (HER) data and the previous studies for the adjacent M1 scheme.

There are no World Heritage Sites, Scheduled Monuments or Registered Battlefields within the area of assessment. A Grade II* English Heritage Registered Park and Garden is located immediately to the east at Luton Hoo.

The preliminary assessment has identified 29 recorded archaeological assets which include:

- geological solution features with the potential to contain Palaeolithic remains;
- find spots of individual artefacts of Palaeolithic, Roman and medieval date;
- Neolithic or Bronze Age occupation evidenced by artefact scatters within the plough soil recovered from fields immediately west and southwest of J10a (these areas have been designated as Archaeological Notification Areas by Bedfordshire County Council);
- the course of the Roman Road;
- extensive evidence for medieval and post-medieval quarrying activity;
- the location of demolished and derelict post-medieval structures; and
- a Second World War Type 24 pillbox.

Palaeolithic

A nationally important Lower Palaeolithic site was excavated in an ancient river valley (HER605; NMR_NATINV-1143669) at Caddington brick pits, south of the M1 motorway and to the southwest of J10a. The *in situ* Palaeolithic working surfaces are thought to represent a flint tool manufacturing and temporary camp site associated with the Ipswichian Interglacial stage (c.125,000 - 70,000 BP). The area has been the subject of various investigations from 1889 to the early 1970s which have also recovered remains of elephant, rhinoceros and deer (Campbell and Hubbard in Sampson 1978, 48-9).

A stray find of a Palaeolithic hand-axe in the Chalk (Fig 2; 1005) has been recorded within 1km of J10a at Slip End (NMR_NATINV-1143724). Additional material has been recovered from trial trench evaluation at Luton Hoo (BCAS 1999, 6).

Within the area of proposed development solution holes (Fig 2; 1026) have been identified immediately west of J10a. Brickearth deposits with possible Palaeolithic potential have been recorded within these solution features.

Mesolithic

A slight scatter of several Mesolithic finds comprising cores and flakes were found between Slip End and the M1 to the southwest of J10a, during fieldwalking at Newlands Farm by the Manshead Archaeological Society (MAS) in 1992 (HER 16969 - Fig 2; 1023).

Neolithic

The programme of fieldwalking carried out by the Manshead Archaeological Society in the fields immediately west and southwest of J10a and the M1 spur road have also found of Neolithic activity in the form of a flint scatter in the ploughsoil (HER15793 -Fig 2; 1013).

A scatter of Neolithic and Bronze Age flints were recorded during archaeological investigations in advance of development at Luton Hoo. An area of 60 hectares was the subject of a fieldwalking survey and the whole area was selectively trial trenched. Field walking recovered a high density of worked flint comprising debitage in the form of waste or preparatory flakes and several cores with elements of both Neolithic and Bronze Age date. A fragment of partially polished Neolithic axe was also recovered. A subsequent trial trench evaluation identified several ditches and a pit possibly of the same date (HER13445 - Fig 2; 1010).

Bronze Age

A Bronze Age scraper (HER15793) was found in the field immediately west of J10a during fieldwalking at Newlands Farm in 1992 (Fig 2; 1013).

Romano-British

The course of a Roman Road the Viatores Route 213 runs to the west of and is crossed by the M1 at Junction 10.

The route of second Roman road is recorded running under Corporation Nurseries approximately 1km to the northwest of J10a. A hoard of Roman coins some of Tetricus (AD 271-273) and a number of 4th century date have also been recovered at this location (HER10471- Fig 2; 1021).

Within the proposed development area a small quantity of possible Romano-British tile was recovered during fieldwalking undertaken across the fields surrounding J10a (HER15793). It is not known whether this represents manuring associated with a Romano-British field system or is evidence for the presence of a substantial building.

A hoard of mainly 3rd century coins was found within the Luton Hoo estate in 1862; this has been interpreted as indicative of a prestigious building nearby (BCAS 1999, 19). A Roman sarcophagus containing a glass jug and four vases was found at Luton Hoo, and is now in the British Museum (Austin 1928, 27).

Medieval

Fieldwalking at Newlands Farm in 1992 noted possible slight remains of ridge and furrow cultivation highlighted during snowy conditions; the ridge and furrow has not been mapped (Hudspith 1994, 7-10). A walkover survey conducted by Scott Wilson in June 2009 did not identify these features and it is possible that they may no longer survive.

Quantities of peg tile and floor tile fragments were recovered during fieldwalking carried out by the Manshead Archaeological Society in 1992 at Slip End and in the fields south of Newlands Farm to the south of J10a (HER 15793 Fig 2; see 1027).

An infilled quarry near Stockings Wood within the Luton Hoo Registered Park and Garden is of possible medieval date. It is visible on the 1847 map and is about 12m in diameter (HER18039 - Fig 2; 1004).

At Stockwood allotments 1km northwest of J10a a medieval silver penny dating to Edward I (1239-1307AD) that would have been issued at Durham was recovered (HER15862 Fig 2; 1022).

Post-medieval

Evidence for post-medieval chalk, gravel and sand extraction is recorded in the form of the remains of numerous former quarry pits. In the fields immediately north and east of Newlands Farm (to the southeast of J10a) the remains of several quarry pits have been recorded on historic maps and aerial photographs (Fig 2; 1012).

A series of undated cropmarks in Luton Hoo Park, to the south of J10a are also possibly the result of former quarrying (HER12452 - Fig 2; 1025, 1028 and 1029).

Luton Hoo, located east was a 17th century country house and estate. The house was rebuilt by Robert Adam (1728-1791) for the 3rd Earl of Bute in 1757. However, following a major fire in 1843 the house was largely rebuilt. The grounds are a Grade II* listed Registered Park and Garden (No. 1567) were designed by Lancelot 'Capability' Brown, and include the widened River Lea, a lime avenue and an arboretum (Fig 2; 2003).

Modern

A Second World War Type 24, pillbox with a modified entrance survives approximately 450m to the northwest of J10a situated within Stockwood Park. In front of the entrance is an L shaped protection wall which now only survives to 18 inches high (NMR Ref. 1422811 - Fig 2;1003).

3 GEOPHYSICAL SURVEY

3.1 Methodology

Geophysical survey was carried out in accordance with English Heritage and the Institute for Archaeologists Guidelines and following the Method Statement (EH 2008; Gaffney, Gater and Ovendon 2002 & Scott Wilson 2009).

The detailed magnetometer survey was undertaken using Bartington Grad601-2 fluxgate gradiometers. The Grad601-2 is constructed as a dual-sensor instrument with two vertical gradiometers separated on a yoke to enable two lines of survey to be recorded in tandem.

The gradiometer coverage was composed of a total of 238 whole and partial 30m x 30m grid-squares. Each survey area was set-out using a combination of Leica System 1200 survey-grade dGPS, and manually divided into grid squares by tape measure and optical square. Each grid square was traversed at rapid walking pace in zigzag mode and magnetic data was recorded every 0.25m along traverses spaced at 1m intervals.

The data was analysed using Geoplot 3.00u software. Low (negative) magnetism is shown as white and high (positive) magnetism as black in the resultant greytone plots. Minimal manipulation was carried out on the data as the raw data is generally of high quality, ensuring that the data-set is uniform (EH 2008, 41-44). Thermal drift in the four fluxgate sensors may slightly alter the balanced level of the gradiometer over a survey, causing 'heading' errors visible as striping along traverses in the data. The 'Zero Mean Traverse' function was applied in order to bring the average level of each data line into a balanced mean of zero. This function retains the gradient of the magnetic field whilst reducing the mean so that each traverse is directly comparable.

The processed data was examined for weak magnetic anomalies under a variety of viewing regimes. The data is presented here in the form of a grey tone image highlighting a broad magnetic anomaly scale (-4.0nT / +4.0nT) which in turn was rectified to the Ordnance Survey base. Interpretative plots have been generated from the results. Figures containing both results and interpretations have been prepared for each field, and are referred to directly in the following section (Figs 3, 4 & 5).

3.2 Results

Field 1 (Fig 3)

Four electricity pylons cross Field 1 north-east to south-west, each producing a 20m radius of magnetic disturbance. The high-voltage line is transmitted below the surface of the ground at an installation at the south-west corner of the field, also producing a large magnetic anomaly. At the north-eastern pylon a highly positive magnetic linear anomaly, probably representing a live buried cable, was detected aligned to the south-west ending at an area of magnetic disturbance. Beyond this, the first of five other, mainly wooden, electricity transmission poles caused anomalies south-westerly parallel to the east field boundary. A pair of areas of disturbance halfway along the eastern boundary was likely to have been related to a nearby pylon.

Clusters of magnetic dipoles (paired positive/negative) and enhanced readings in the southern corner of Field 1 relate to the magnetised debris from the recent construction of an Electricity Sub-Station. Small magnetic dipoles can indicate ferrous waste and brick debris in the topsoil. A circular area of such anomalies coinciding with a depression in the south of the field suggests a likely dump of brick debris from the recent building activity.

A slight dry valley was noted orientated north to south across the centre of Field 1. The topographic feature coincided exactly with a set of broad positively magnetised anomalies. Gross directionality in the magnetic anomalies across the field, visible as a 'ripple' effect on the grey tone image (Fig 3), may provide an indication of the topography of the clay-with-flints geological substrate.

Field 2 (Fig 4)

A single electricity pylon intruded into the north of the survey area producing the usual 20m radius of magnetic disturbance. Adjacent to the east of this was an area of dipolar magnetism, possibly representing brick debris. Further disturbance was noted in four

areas against the northern and eastern field boundaries. Large positive anomalies, generally aligned towards the north-east demonstrate similar characteristics to the geological features in Field 1. Similar geological topography was also evident. Individual, stronger dipolar anomalies, detected around and especially in the south of the area indicate larger pieces of ferrous debris in the topsoil.

Field 3

A former quarry was still in existence and together with substantial undergrowth it was not possible to survey within Field 3.

Field 4 (Fig 5)

Former quarries were still in existence within Field 4, the northernmost of which was not surveyable. A pair of horse troughs in the north-west of the field both produced haloes of magnetic disturbance. A linear chain of positive and negative magnetic anomalies, indicating a ferrous pipeline, aligned north-east to south-west, between the northern quarry and northern boundary. Two similar pipes were detected, one from the same quarry south-west to Newlands Road and the second along the western, roadside, boundary.

The southern quarry of Field 4 was subject to survey. The edges produced a weakly positive signature surrounding a cluster of dipoles, probably indicating ferrous debris. Similar ferrous anomalies were detected less densely throughout the northern half of the field.

Field 5 (Fig 5)

Numerous diffuse positive anomalies detected throughout Field 5 are attributable to a geological source. These culminate in a pair of broad linear positive anomalies orientated north-east to south-west in the south of the field, also geological in basis. A ferrous pipeline detected across the north of the field is probably the same as that on a south-west alignment in Field 4 on the east side of Newlands Road. Ferrous magnetic dipoles were located throughout the area.

A curving positive magnetic linear anomaly, possibly a buried ditch, was identified on a north to south orientation towards the centre of Field 5 (Fig 5).

4 TRIAL TRENCHING AND WATCHING BRIEF

4.1 Aims

The general aims of the trial trenching and watching brief were:

- to identify the presence or absence of archaeological remains
- to determine the likely extent, state of preservation and quality of potential archaeological remains
- to identify the presence/absence and likely extent of any modern ground disturbance

Specifically:

- to evaluate the results of geophysical survey
- to determine the location, nature, extent, depth, date, condition, preservation, significance and stratigraphic complexity of archaeological deposits and determine the general distribution of prehistoric, Roman and medieval evidence within the proposed development area
- to determine the likely range, quality and quantity of artefactual and environmental evidence present
- to provide sufficient supporting evidence for the Project's cultural heritage impact assessment and Environmental Statement
- to determine the level of risk that the archaeological resource would present to the construction programme and to inform an appropriate mitigation strategy.

4.2 Methodology

The archaeological trial trenching comprised the machine excavation of seven trenches, which were excavated using a JCB-type excavator under archaeological supervision. Trench 5 measured 50m long and 2m wide, Trenches 1 and 4 were 25m long and 4m wide and Trenches 2, 3, 6 and 7 were 25m long and 2m wide (Fig 1).

The trenches were related to the Ordnance Survey National Grid using a Leica 1200 Global Positional System. The topsoil before excavation and spoil heaps were scanned both by eye and by metal detector to recover any additional artefactual evidence. Archaeological information was recorded on pro-forma sheets, with a unique context number being allocated to each distinct deposit and feature. Four trenches contained archaeological features (Trenches 1 – 3 and 5) and were planned at 1:50 (Fig 7). A photographic record comprising both 35mm monochrome negatives, and colour transparencies was maintained, with additional digital photographs.

A watching brief was undertaken on 39 geotechnical test pits (Fig 9). Each test pit was observed during machine excavation and all layers, including the first natural layer, were recorded and photographed.

All records were compiled during fieldwork into a comprehensive and fully cross-referenced site archive. The Northamptonshire Archaeology site code assigned was NFL09. The museum accession number is: LUTNM: 2009/122.

All works were carried out according to the IfA Code of Conduct (1985, revised 2009) and *Standard and Guidelines for Archaeological Evaluation* (IfA 1994, revised 2008), in addition, all works complied with the guidelines detailed in *Standards for Field Archaeology in the East of England* (Gurney 2003).

All procedures complied with the Northamptonshire County Council Health and Safety provisions and Northamptonshire Archaeology Health and Safety at Work Guidelines.

4.3 Trial trenching - general stratigraphy

All trenches were excavated to undisturbed natural geology which was encountered at between 0.24m to 0.35m below current ground level. Mixed horizons of natural sands and gravels with clay with flint nodules and occasional chalk pebbles were present throughout the trenches.

The natural geology in all trenches was overlain by a thin and often erratic layer of orange-brown subsoil measuring up to 0.08m thick. This was overlain by topsoil, friable, mid grey-brown sandy soil, up to 0.30m thick. (Individual context information by trench is tabulated in Appendix 1: Context Data).

4.4 Archaeological features

The evaluation recorded three undated gullies, a ditch and pit in Trenches 1-3 and 5 (Figs 6 and 7) (Appendix 1).

Trench 1

Trench 1 was orientated north-east to south-west. The trench contained a single gully terminal [105] which cut the subsoil. The gully was aligned north-west to south-east (Figs 7 and 8; Section 3 oblique profile, Fig 10) with a U-shaped profile and was 0.80m wide by 0.36m deep. Its fill (104) was mid brownish-grey silty sandy loam with some gravel. Within the fill was a fragment of post-medieval brick and an iron nail. Height of natural (mOD) north-east end 154.35m, south-west end 153.11m.

Trench 2

Trench 2 was orientated north-east to south-west. Pit [205] was partially visible on the south side, with the remainder extending beyond the limits of the trench (Figs 7 and 8; Section 4 and Fig 11). It appeared to be circular in shape with a wide, U-shaped profile, 1.40m wide and 0.30m deep and cut the natural (203). Its fill (204) was mid to dark brown silty sand with gravel inclusions overlain by topsoil. No finds were present.

To the south-west was gully [207], aligned north-west to south-east (Figs 7, 8; Section 5 and Fig 12). It had a U-shaped profile and was 0.90m wide and 0.20m deep and cut the natural (203). Fill (206) was mid orange-brown silty sand with occasional small stones. There were no finds present. The height of the natural geology (mOD) was, north-east end 159.13m, south-west end 158.20m.

A very sparse subsoil (202) was present in patches within the trench, but did not appear to overlay either feature.

Trench 3

Trench 3 was orientated north-east to south-west. The trench contained a single ditch [305] aligned north to south with a V-shaped profile, 1.4m wide and 0.4m deep which cut the subsoil (302) (Figs 7 and 8; Section 2). Fill (304) was mid grey-brown sandy loam with charcoal flecks and occasional gravel. The fill contained two fragments of undated fired clay. The height of the natural geology (mOD) was, north-east end 150.31m, south-east end 148.81m.

Trench 5

Trench 5 was orientated north-west to south-east. A single gully [505] curved from the north to the south-east (Figs 7 and 8; Section 1). It had a U-shaped profile and was 0.40m wide and 0.16m deep. The fill (504) was mid orange-brown silty clay with grey mottling, gravel and flint nodules and occasional charcoal flecks and overlain by subsoil (502). There were no finds present. The height of the natural geology (mOD) was, north-west end 152.97m, south-east end 152.69m.

4.5 Trenches with no archaeology present

Trench 4

Trench 4 was aligned north-east to south-west. The height (mOD) of natural bands of orange sandy clay, with flint nodules and med grey-brown clay with gravel and flint nodules was, north-east end 151.19m, south-west end 150.04m.

Trench 6

Trench 6 was aligned east to west. The height (mOD) of natural bands of orange sandy clay with flint nodules and med grey-brown clay with gravel and flint nodules was, east end 154.42m, west end 153.18m.

Trench 7

Trench 7 was aligned north-west to south-east. The height (mOD) of the natural, mixed orange clay, with very frequent chalk and flint nodules was, at north north-west end 151.60m, south, south-east end 150.89m.

4.6 Watching brief

The watching brief on 39 geotechnical test pits (Fig 9) found that a similar, general stratigraphy was present in the upper layers of the test pits to that recorded in the trial trenches (above, section 4.1). An undated gully [905] (Fig 13) was observed at the north end of Test Pit 9. It was aligned east-west and was 0.80m wide by 0.28m deep and cut the sparse subsoil and natural red clay with flints. The fill (904) was pale to mid orange-brown silty clay with frequent pebbles and flint (Individual context information by test pit is tabulated in Appendix 2: Test Pit Data).

No further archaeological features or artefacts were present. However, possible brickearth was noted at a depth of c1.50m below the ground surface in Test Pit 20 (Fig 9).

5 THE FINDS

Four small badly abraded undiagnostic sherds of post-medieval glazed red earthenware (3) and unglazed earthenware (1) were recovered from topsoil and subsoil deposits overlying the trenches/test pits. In Trench 7, Topsoil (701) contained 1 sherd; Subsoil (702) 1 sherd. In topsoil at Test pit 34 were 2 sherds. These were most likely to have been deposited during manuring of the fields.

5.1 Small finds by Tora Hylton

There are three post-medieval small finds, an iron nail, a rumbler bell and a stud/fitting. The iron nail was recovered from fill (104) of gully [105], it measures 66mm in length and comprises a tapered square-sectioned shank surmounted by a large flat sub-circular head. It probably would have been for use with timbers.

A rumbler bell and possible stud/fitting were located within topsoil during metal detecting, the former from Trench 3 and the latter Trench 1. The rumbler bell is manufactured from copper alloy, it has been cast in four parts (upper and lower half, loop and pea) and it is pierced for acoustic effect. The upper and lower sections are decorated with a 'sunburst' motif and adjacent to the elongated sounding hole is a Founders Mark in the form of hammer within a shield. The iron pea which would have sounded by rattling against the interior wall has corroded and adhered to the wall. Stylistically this rumbler dates to the late 17th century. Finally there is an iron disc with a vestige of a shank protruding from the underside. Traces of copper alloy are evident on the upper surface of the disc, perhaps suggesting that it is a possible decorative stud or fitting.

5.2 Ceramic building material by Pat Chapman

A group of ceramic roof tile fragments from the topsoil were noted. Their date range could be from the 14th to the early 19th centuries.

Brick/tile

One abraded brick/tile, from fill (104) of gully [105], is 36mm thick, weighing 655g. It is very hard and fine and has been fired to a mixed pink and buff colour. It could be a paving tile or a thin brick. The fabric would indicate a post-medieval date for either a brick or a floor tile for non-residential use.

Fired clay

Two very small hard, irregular and undiagnostic fragments of fired clay came from fill (304) of ditch [305].

6 DISCUSSION

Archaeological investigations, consisting of geophysical survey and trial trench evaluation together with a watching brief of geotechnical test pits along the route of the proposed junction improvements of Junction 10A of the M1, was undertaken during August and September 2009.

Geophysical survey in Fields 1, 2 and 5 elucidated evidence of the underlying geology in terms of direction of strata (Fields 1 and 2), the dry valley of Field 1 and a variety of discrete deposits. The relatively recent construction work associated with a new electrical substation in the south of Field 1 left distinct magnetic traces from brick rubble and iron fragments. A single possible archaeological feature was detected, a curving north-south ditch in the centre of Field 5. However, the geophysical survey failed to identify any of the archaeological features subsequently revealed by the archaeological trial trenching. This shows that they had developed little or no magnetic enhancement relative to the natural substrate.

Magnetic enhancement of soil occurs principally through human activities, particularly burning and the introduction of ceramic or industrial detritus. The decay of organic refuse may also be a factor (Gaffney & Gater 2003, 37-9). Thus settlement and industrial features, which are associated with intense human activity, tend to produce much clearer geophysical anomalies than field boundaries and other peripheral remains (Gaffney & Gater 2003, 126-7).

Furthermore, the potential of a soil to undergo magnetic enhancement depends upon its mineralogical composition. There is thus a broad correlation between the geology of a site and its suitability for magnetic survey. In the case of clay-with-flints and brickearth, responses are variable (EH 2008, 15) and there are previous instances where archaeological remains cut into such deposits proved undetectable (eg Foard-Colby 2008).

It is therefore possible that some archaeological features may not have been detectable, but if so, then it is most likely that these would be of low magnetic enhancement and not relate to primary settlement areas.

The positioning of the archaeological trial trenches was influenced by the results of the geophysical survey. However, the single anomaly found by geophysical survey was not targeted by the trenches as the trenches were designed to test the areas of

potential impact caused by the proposed route options. Blank areas were also targeted where geophysics did not locate any anomalies. Trench 2 was positioned to investigate a potential buried ground surface within a dry valley. Trench 4 was positioned to assess potential brick earth deposits and Trench 5 to investigate a possible linear anomaly.

Trial trenching in Fields 1, 2 and 4, identified a single post-medieval gully and a small number of undated features. In Trench 1, the fill of a gully terminal contained a post-medieval brick and an iron nail. A gully and pit in Trench 2, a ditch in Trench 3 and a gully in Trench 5 were all undated. It is difficult to date the features as their form doesn't suggest any clear function, however the gullies do have a similar alignment and therefore may be part of contemporary field divisions.

A rumbler bell, dated 16th to 17th century, and an undated iron disk were recovered by metal detection from the topsoil of Trenches 3 and 1 respectively. Four sherds of post-medieval pottery were also recovered from Trench 7 and Test Pit 34. These finds were probably deposited in the topsoil/subsoil during manuring and cultivation of the field.

During the watching brief of the geotechnical test pits, an undated gully was observed in Test Pit 9 and may relate to the gullies identified in Trenches 1, 2 and 3. No further archaeological features or artefacts were present.

The possible 'brickearth', which was observed c1.50m below the surface in geotechnical Test Pit 20, may be a wind born deposit within a hollow such as a geological solution feature, sealed by later natural sands and gravel. There was no evidence of brickearth elsewhere in the archaeological trial trenches or other geological tests pits.

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Web sites

BGS GeoIndex <http://www.bgs.ac.uk/GeoIndex/index.htm>

Appendix 1: Context data

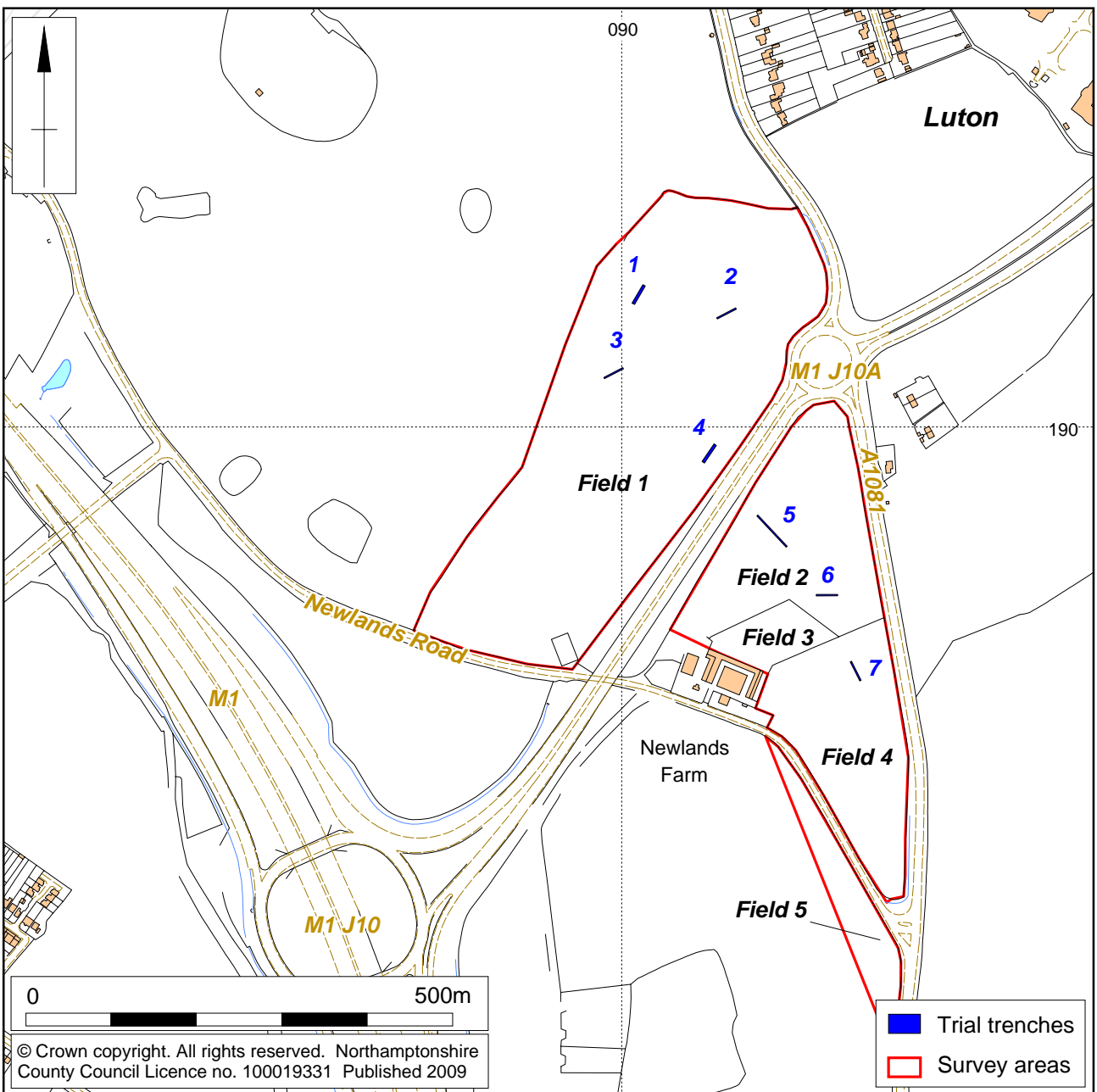
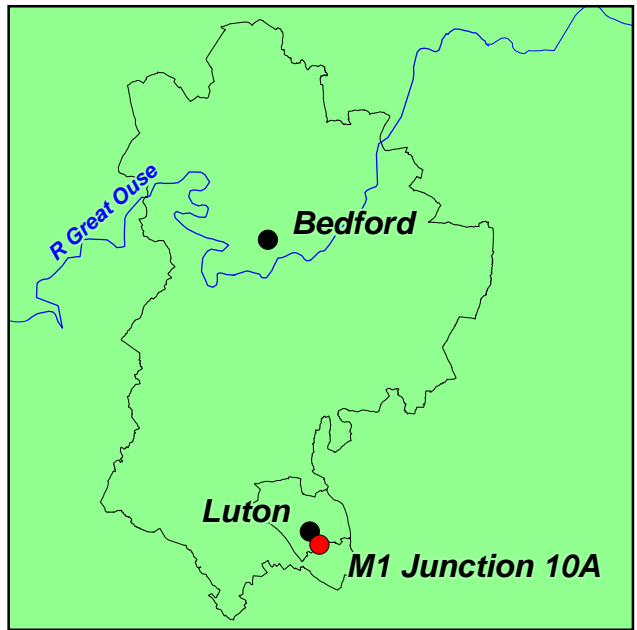
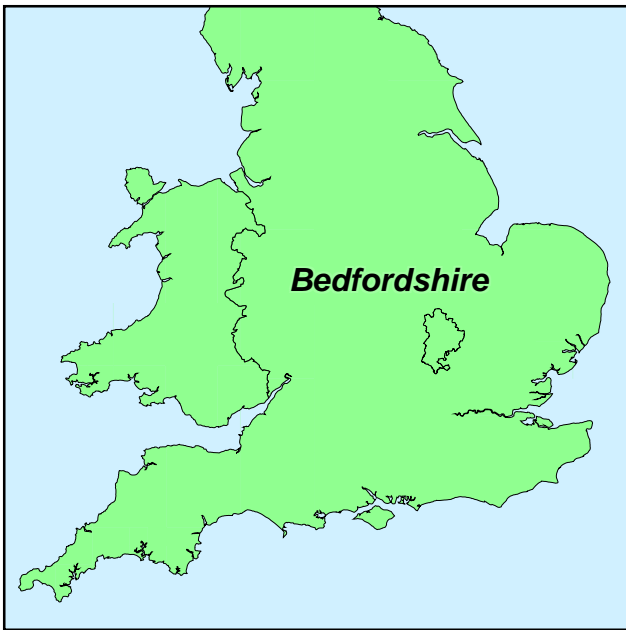
Trench	Context	Type	Description	Dimensions /thickness	Artefact type
1	101	Topsoil	Friable mid grey-brown loam	0.20 - 0.28m thick	Fe object (stud/fitting)
	102	Subsoil	Light orange-brown sandy loam	Intermittent, max 0.05m	1 sherd of post-med pottery
	103	Natural	Natural orange sand and gravel with flint nodules		
	104	Fill of (105)	Mid grey-brown silty loam with some gravel and flint	0.36m	Brick/tile, Fe nail
	105	Cut	Cut of gully terminal	0.8m wide, 0.36m deep	
2	201	Topsoil	Friable mid grey-brown loam	0.20m thick	
	202	Subsoil	Light orange-brown sandy loam	Intermittent, max 0.05m	
	203	Natural	Same as 103 natural orange sand and gravel with flint nodules		
	204	Fill of (205)	Mid to dark brown silty sand with some gravel and flint	0.30m	
	205	Cut	Cut of pit	1.40m wide, 0.30m deep	
	206	Fill of (207)	Mid orange-brown silty sand with some gravel and flint	0.20m	
	207	Cut	Cut of gully	0.90m wide, 0.20m deep	
3	301	Topsoil	Friable mid grey-brown loam	0.20 - 0.28m thick	Cu bell
	302	Subsoil	Mid orange-brown loam	Intermittent, max 0.05m	
	303	Natural	Natural orange sand and gravel with flint nodules		
	304	Fill of (305)	Mid grey-brown sandy loam with charcoal flecks and gravel	0.4m	Fired clay
	305	Cut	Cut of ditch	1.4m wide, 0.4m deep	
4	401	Topsoil	Grey-brown sandy loam	0.27m thick	
	402	Subsoil	Orange brown sandy clay with gravel	Intermittent, max 0.05m	
	403	Natural	Bands of orange sandy clay with flint nodules and med grey-brown clay with gravel and flint nodules		
5	501	Topsoil	Grey-brown sandy loam	0.20 – 0.25m thick	
	502	Subsoil	Light to mid orange-brown sandy loam	0.02 – 0.08m thick	
	503	Natural	Bands of orange sandy clay with flint nodules and med mid brown clay with gravel and flint nodules		
	504	Fill of (505)	Mid orange-brown silty clay with grey mottling, charcoal flecks, some gravel and flint nodules	0.16m	
	505	Cut	Cut of gully	0.40m wide 0.16m deep	

Trench	Context	Type	Description	Dimensions /thickness	Artefact type
6	601	Topsoil	Grey-brown sandy loam	0.20 – 0.25m thick	1 sherd of post-med pottery, tile
	602	Subsoil	Light to med orange-brown sandy loam	0.02 – 0.08m thick	
	603	Natural	Bands of orange sandy clay with flint nodules and med grey-brown clay with gravel and flint nodules		
7	701	Topsoil	Grey-brown sandy loam	0.10 – 0.15m thick	Tile frags
	702	Subsoil	Mixed yellow-brown silty clay with frequent chalk pebbles	0.10m thick	Tile frags
	703	Natural	Mixed orange clay with very frequent chalk and flint nodules		

Appendix 2: Test pit data

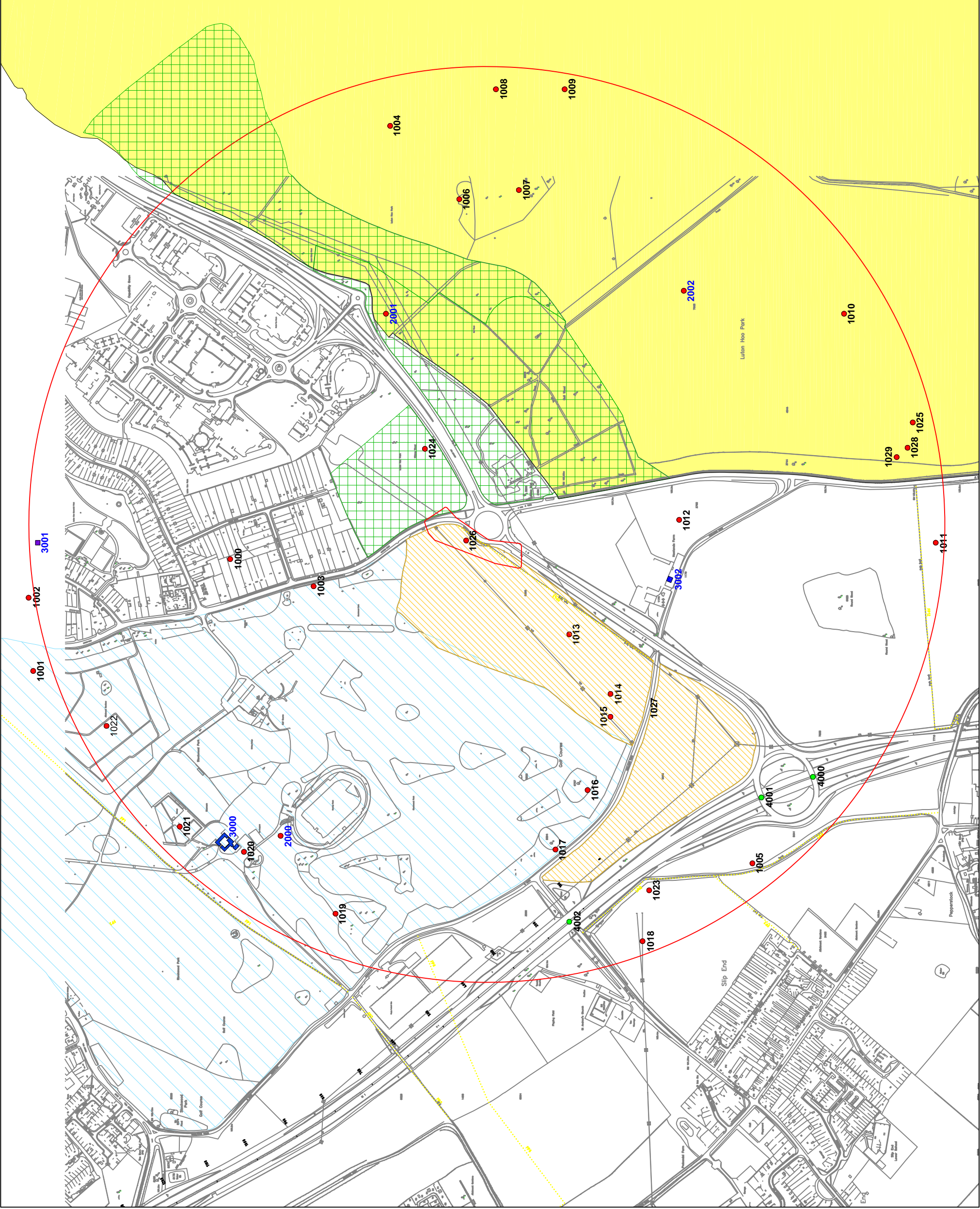
Test Pit	Context	Type	Description	Dimensions /thickness
1		Topsoil	Friable light yellow-brown sandy loam	0.25m thick
		Natural	Light orange brown silty-clay loam with gravels	
2		Topsoil	Dark grey/brown sandy loam	0.30m thick
		Natural	Mid orange brown sandy gravel	
3		Topsoil	Mid grey/brown loam	0.33m thick
		Subsoil	Mid brown-grey loam	0.05m thick
		Natural	Mid brown-grey loam	
4		Topsoil	Grey brown sandy loam	0.30m thick
		Subsoil	Orange brown sandy clay with gravel	0.14m thick
		Natural	Orange sand and gravel with flint nodules	
5		Topsoil	Dark grey/brown sandy loam	0.29m thick
		Natural	Mid orange brown sandy gravel	
6		Topsoil	Dark grey/brown sandy loam	0.30m thick
		Natural	Friable light yellow-brown sandy loam	0.02–0.08m thick
7		Topsoil	Dark grey/brown sandy loam	0.32m thick
		Natural	Friable light yellow-brown sandy loam	
8		Topsoil	Mid dark brown-grey loam	0.4m thick
		Natural	Orange sand and gravel	
9		Topsoil	Dark grey/brown sandy loam	0.27m thick
		Subsoil	Orange brown sandy clay with gravel	0.07m thick
		Natural	Friable light yellow-brown sandy loam	
	904	Fill	Mid orange-brown silty-clay with flints and pebbles	0.28m deep
	905	Cut	Gully, E-W aligned	0.8m wide
10		Topsoil	Dark grey/brown sandy loam	0.31m thick
		Natural	Mid orange brown sandy gravel	
11		Topsoil	Dark grey/brown sandy loam	0.31m thick
		Natural	Mid orange brown sandy gravel	
12		Topsoil	Grey-brown loam	0.25m thick
		Subsoil	Grey-orange-brown clay with flint	0.05m thick
		Natural	Light orange-brown silty-clay with flint	
13		Topsoil	Mid grey loam	0.35m thick
		Subsoil	Mid brown silty-sand	0.10m thick
		Natural	Orange sand with gravel	
14		Topsoil	Mid brown-grey loam	0.34m thick
		Subsoil	Light brown-orange silty-sand	0.06m thick
		Natural	Orange sand and gravel with flint	
15		Topsoil	Mid grey-brown loam	0.22m thick
		Subsoil	Mid grey-orange/brown silty-clay loam with gravel	0.51m thick
		Natural	Orange-brown silty-clay with grey mottling, gravel and flint	
16		Topsoil	Mid grey-brown loam	0.22m thick
		Subsoil	Mid grey-orange/brown silty-clay loam with gravel	0.51m thick
		Natural	Orange-brown silty-clay with grey mottling, gravel and flint	
17		Topsoil	Mid brown-grey loam	0.34m thick
		Subsoil	Mid brown-orange gravely sand	0.10m thick
		Natural	Orange sand and gravel	
18		Topsoil	Mid brown-grey loam	0.3m thick
		Subsoil	Mid brown silty-sand with gravels	0.22m thick
		Natural	Orange sand with gravel and flint	
19		Topsoil	Mid dark brown-grey loam	0.28m thick
		Natural	Orange sand with gravel and flint	
20		Topsoil	Grey-brown sandy-loam	0.3m thick
		Natural	Mid orange-brown sand with gravel and flint;	

Test Pit	Context	Type	Description	Dimensions /thickness
			possible brickearth was noted at a depth of c1.50m below the ground surface	
21		Topsoil	Grey-brown loam	0.3m thick
		Subsoil	Mid orange-brown sandy-clay with gravel and flint	0.2m thick
		Natural	Light orange-brown sandy-clay with gravel and flint	
22		Topsoil	Grey-brown loam	0.25m thick
		Natural	Light red-orange/brown sandy-clay with gravel and flint	
23		Topsoil	Dark brown-grey loam	0.24m thick
		Natural	Orange sand with gravel and flint	
24		Topsoil	Mid brown-grey loam with flint	0.25m thick
		Natural	Mid orange sand with gravel and flint	
25		Topsoil	Light grey-brown sandy-loam	0.32m thick
		Natural	Light orange-brown sandy loam	
26		Topsoil	Mid brown-grey clay-loam with stones	0.15m thick
		Subsoil	Mid brown-sandy-loam with small stones	0.13m thick
		Natural	Orange clay-sand with gravel and flint	
27		Topsoil	Dark-brown grey-clay-loam	0.16m thick
		Subsoil	Mid brown loam with small stones	0.15m thick
		Natural	Mid brown-orange sandy-clay with flint	
28		Topsoil	Dark brown-grey clay-loam	0.14m thick
		Subsoil	Mid brown loam with stones	0.08m thick
		Natural	Chalk	
29		Topsoil	Dark grey-brown clay with small stones	0.17m thick
		Subsoil	Dark brown loam with stones	0.15m thick
		Natural	Mid brown-orange sandy-clay with flints	
30		Topsoil	Grey-brown loam	0.25m thick
		Subsoil	Dark orange-brown silty-clay	0.63m thick
		Natural	Mid orange-brown sands and gravels	
31		Topsoil	Grey-brown loam	0.28m thick
		Subsoil	Mid orange-brown loam sandy-clay with small stones	0.15m thick
		Natural	Mid orange-brown sand and gravel with flints	
32		Topsoil	Dark grey-brown loam	0.38m thick
		Subsoil	Dark orange-brown loam with gravel and flints	0.10m thick
		Natural	Mid orange-brown sandy-clay with gravel and flints	
33		Topsoil	Dark grey-brown loam	0.30m thick
		Subsoil	Dark orange-brown loam with gravel and flints	0.15m thick
		Natural	Mid orange-brown sandy-clay with gravel and flints	
34		Topsoil	Grey-brown loam (2 sherds of post-med pottery)	0.36m thick
		Subsoil	Orange-brown sandy-loam	0.10-0.13m thick
		Natural	Orange sands and gravels	
35		Topsoil	Grey-brown loam	0.34m thick
		Natural	Orange sands and gravels	
36		Topsoil	Grey-brown loam	0.3m thick
		Natural	Mid orange-brown flints and gravels	
37		Topsoil	Grey-brown loam	0.35m thick
		Subsoil	Orange-brown sandy loam	0.3m thick
		Natural	Light orange-brown sands and gravels	
38		Topsoil	Mid brown-grey loam	0.2m thick
		Subsoil	Mid brown-grey silty-clay	0.12m thick
		Natural	Orange sand with gravel and flint	
39		Topsoil	Mid grey-brown loam	0.3m thick
		Subsoil	Light orange clay-sand with gravel and flint	0.23m thick
		Natural	Mid orange sand with gravel and flint	



1:7500

Site location Fig 1



This drawing may be used for the purpose intended and only written dimensions shall be used.

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- Building 3000
- Motorway Structures 4001
- Archaeological Notification Area (BCC Designation) 1034
- English Heritage Registered Park and Garden 2002
- BCC Historic Landscape Designation 2000
- Ancient Woodland 2001

Revision Details	By	Check	Date	Suffix
M1-J10A Improvements				

Job Title: M1-J10A Improvements

Drawing Title: Cultural Heritage Assets

Scale(s) at A3: 1:8000

Drn: JT

Chk: JT

App: JT

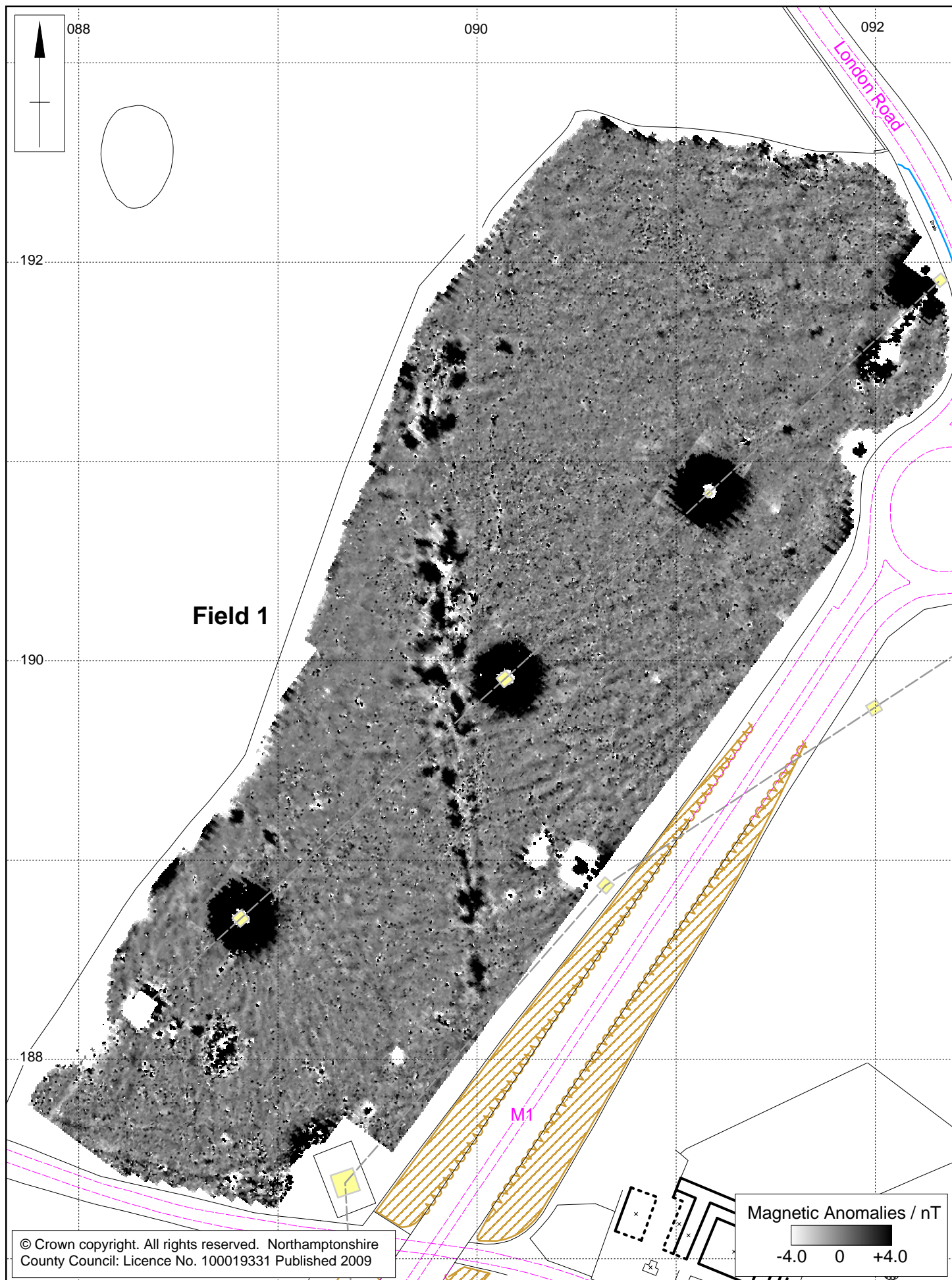
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Dwg Ref Number: D1214/75/W/SI/003

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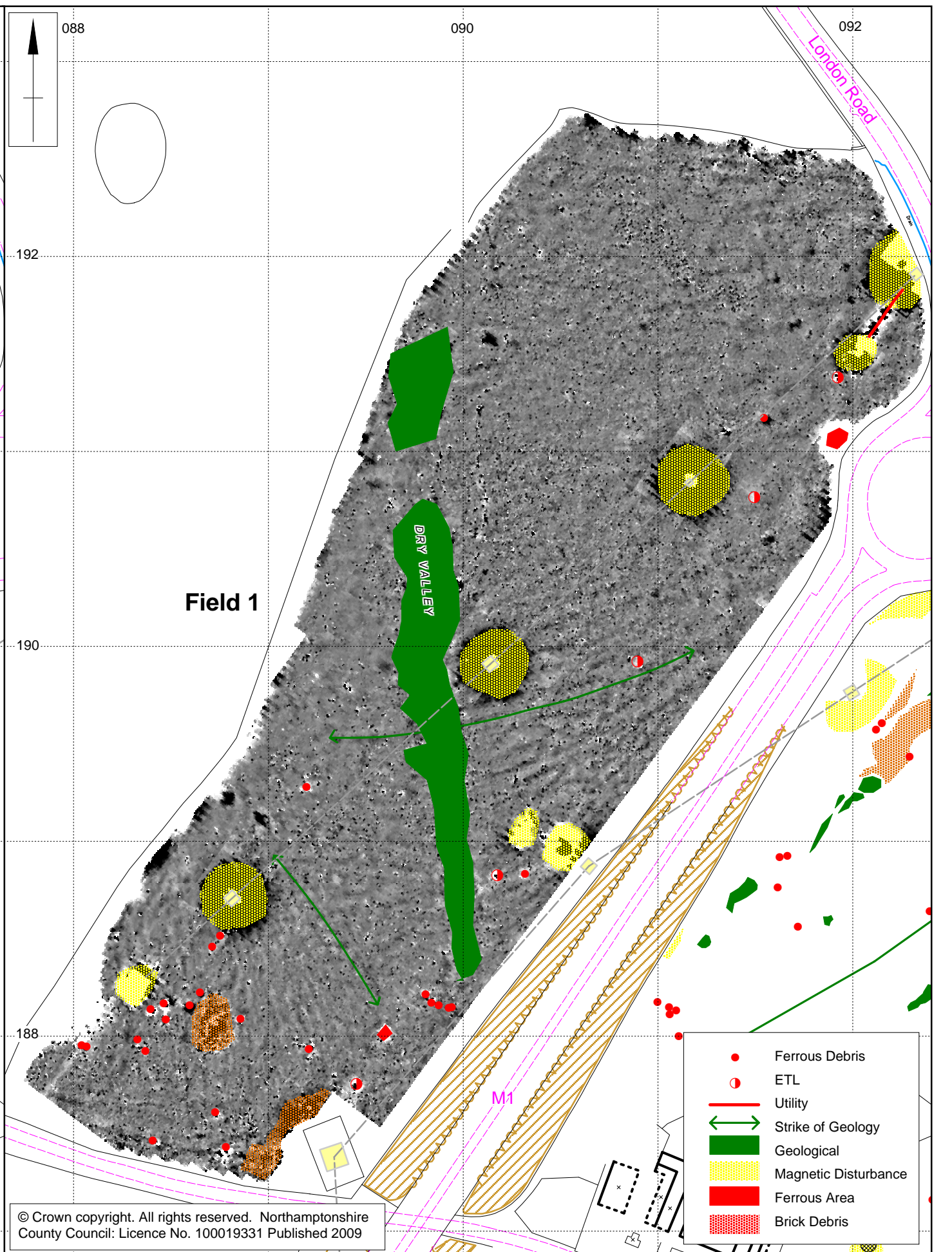
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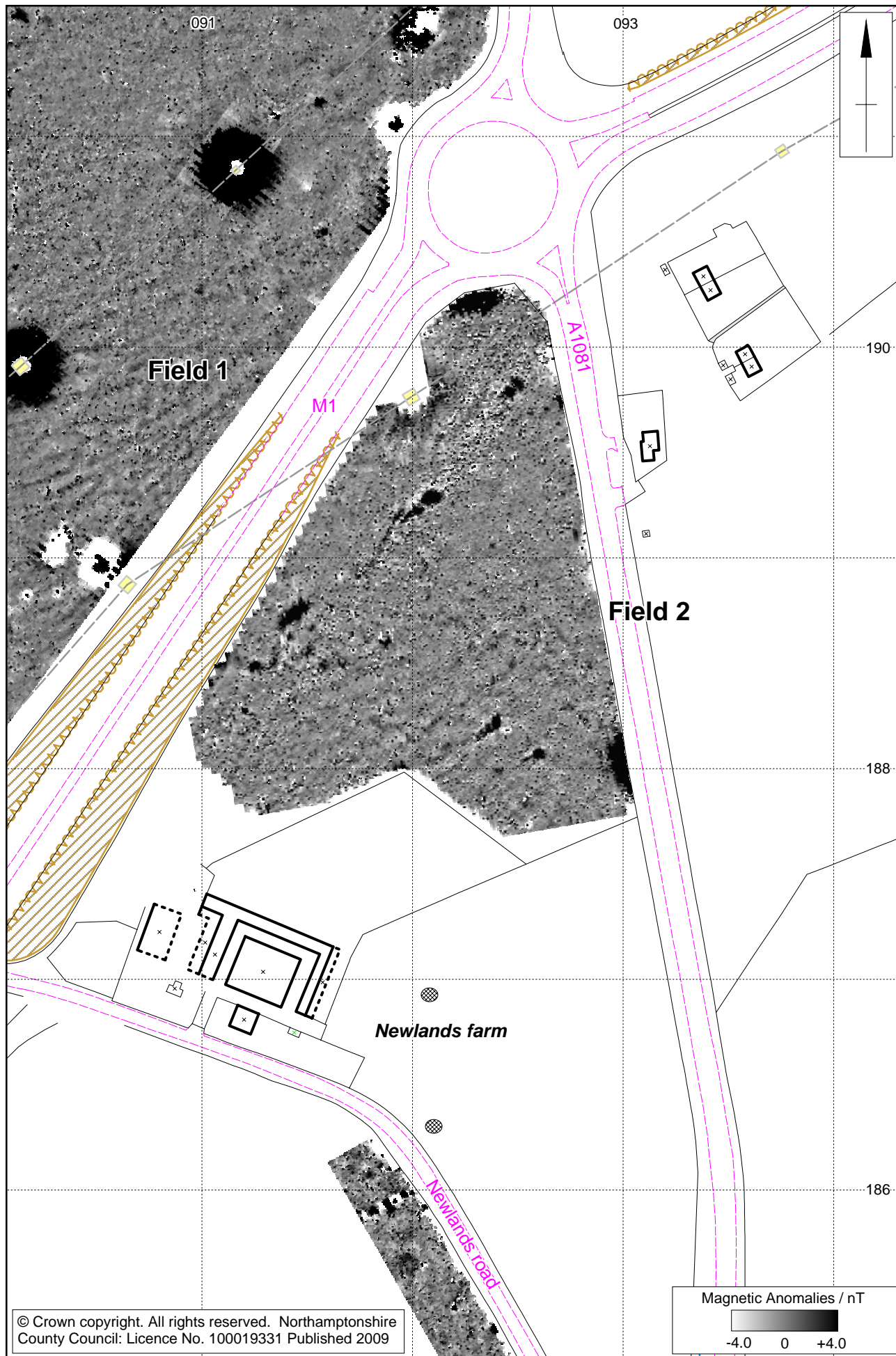
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Detailed Survey Results Field 1



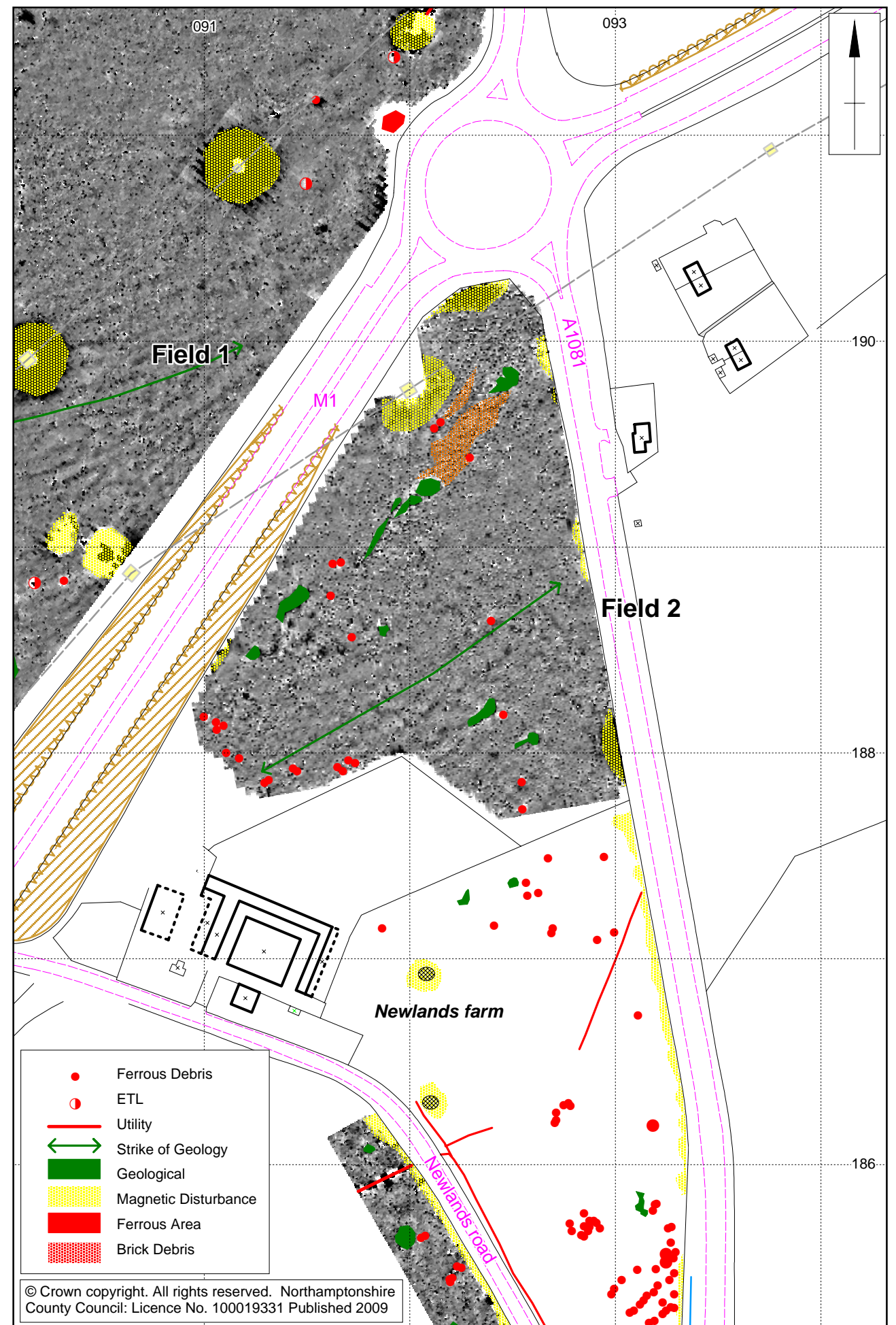
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Detailed Survey Interpretation Field 1 Fig 3



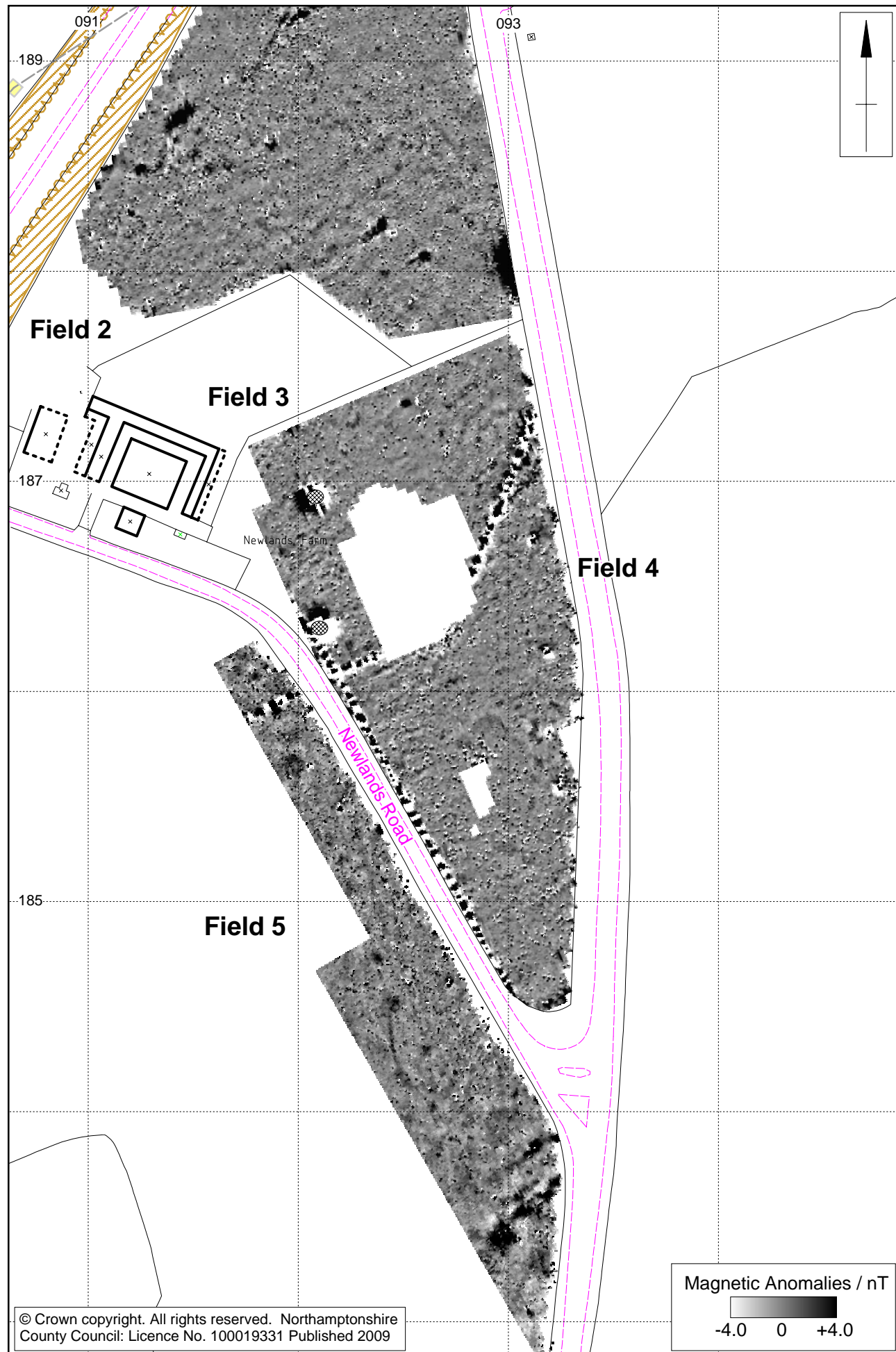
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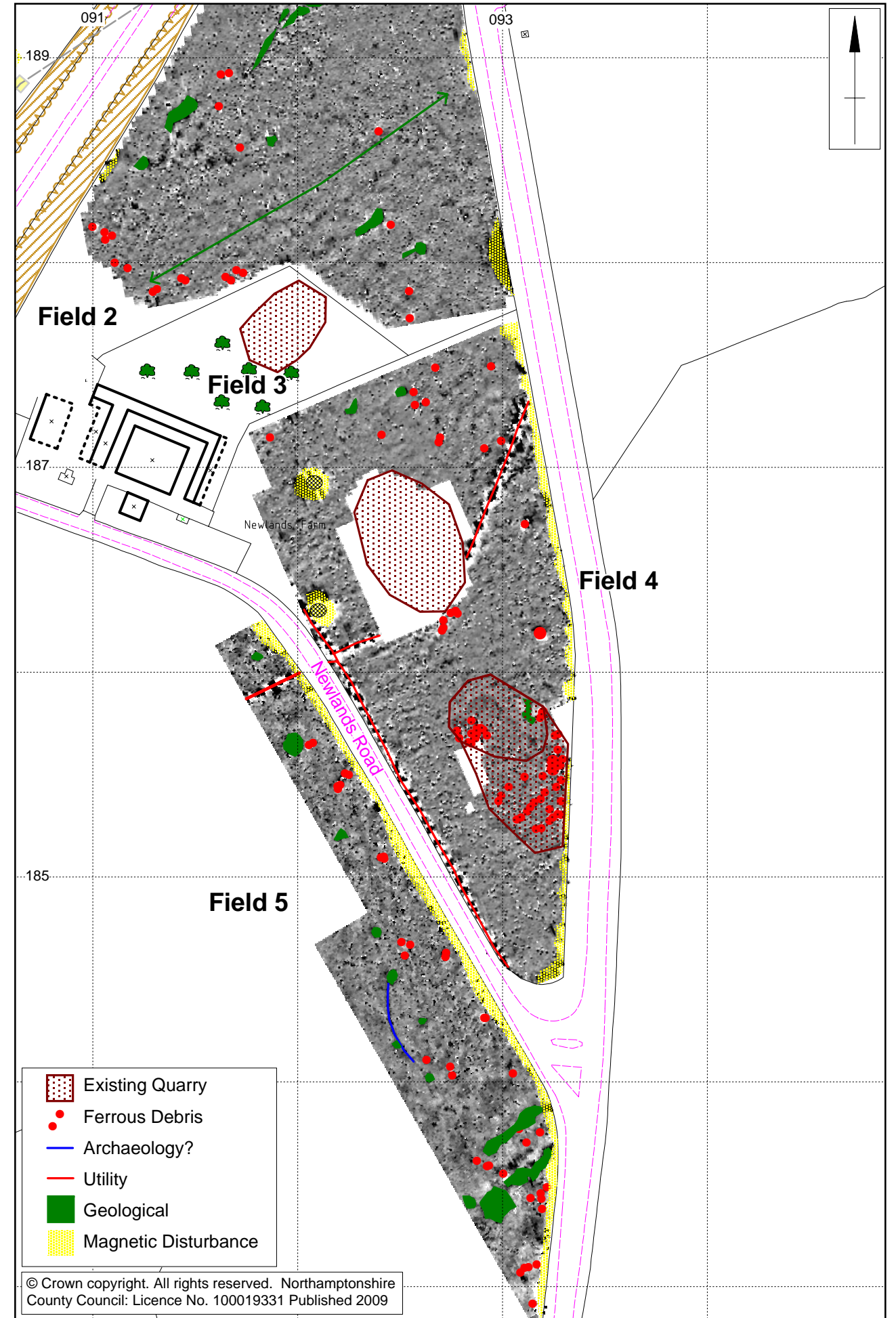
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Detailed Survey Interpretation Field 2 Fig 4



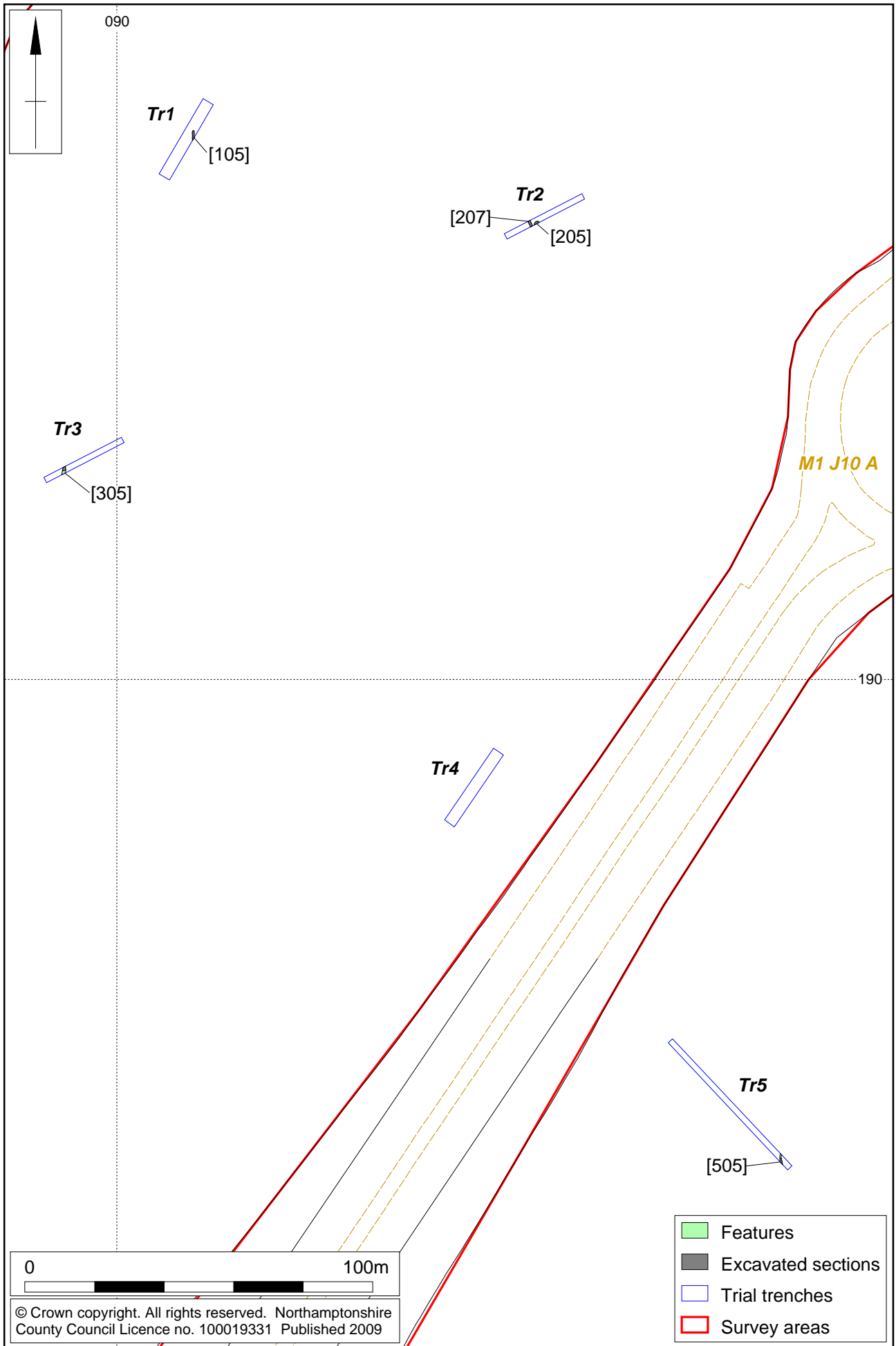
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Detailed Survey Results Fields 4 & 5



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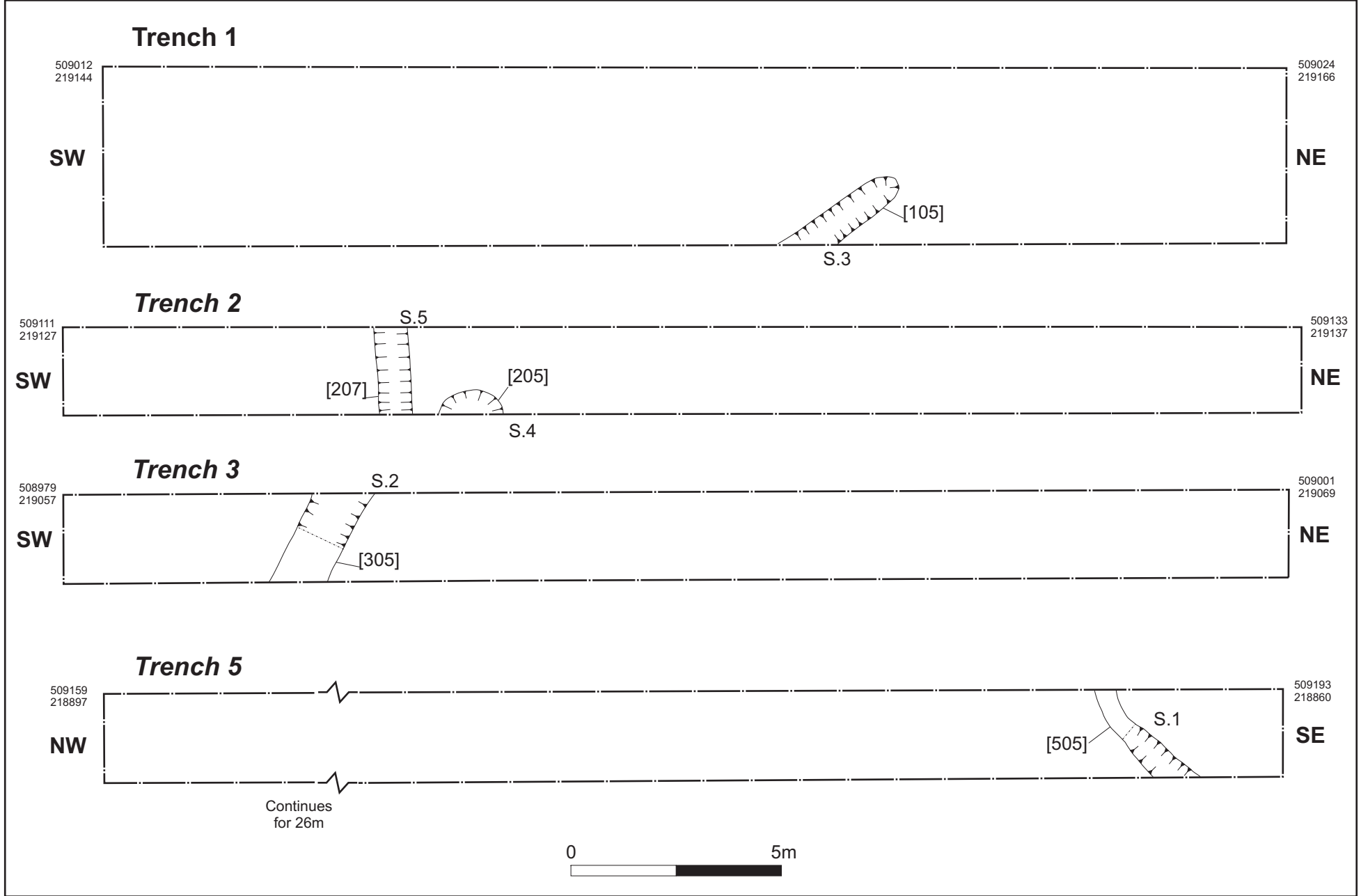
Detailed Survey Interpretation Fields 4 & 5 Fig 5



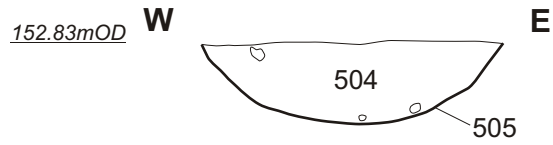
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Plan of trenches 1,2,3,4 and 5 Fig 6

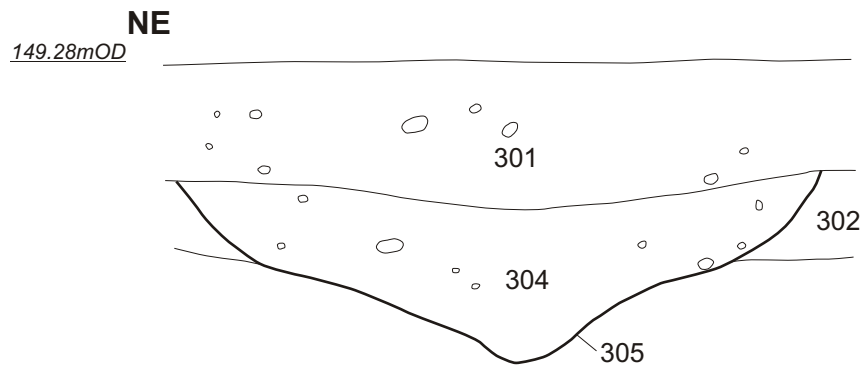
Plans of trenches 1, 2, 3 and 5 Fig 7



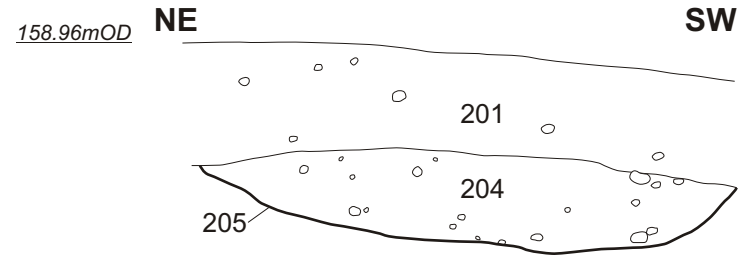
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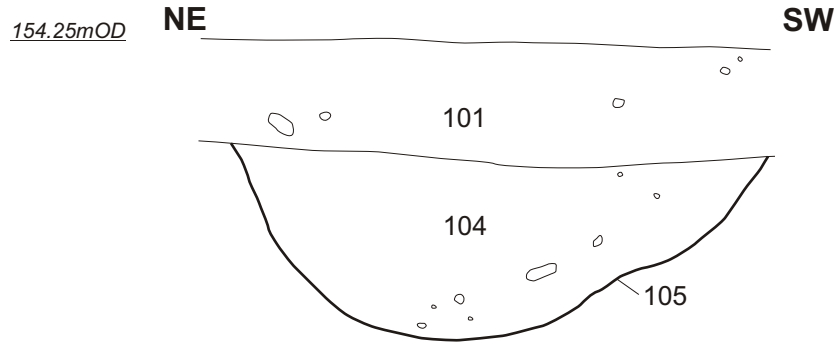
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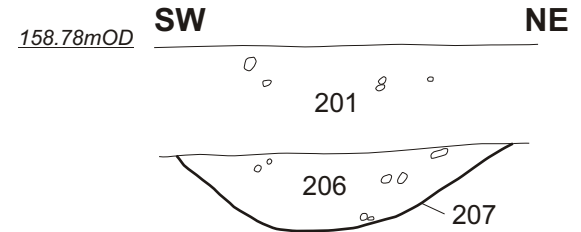
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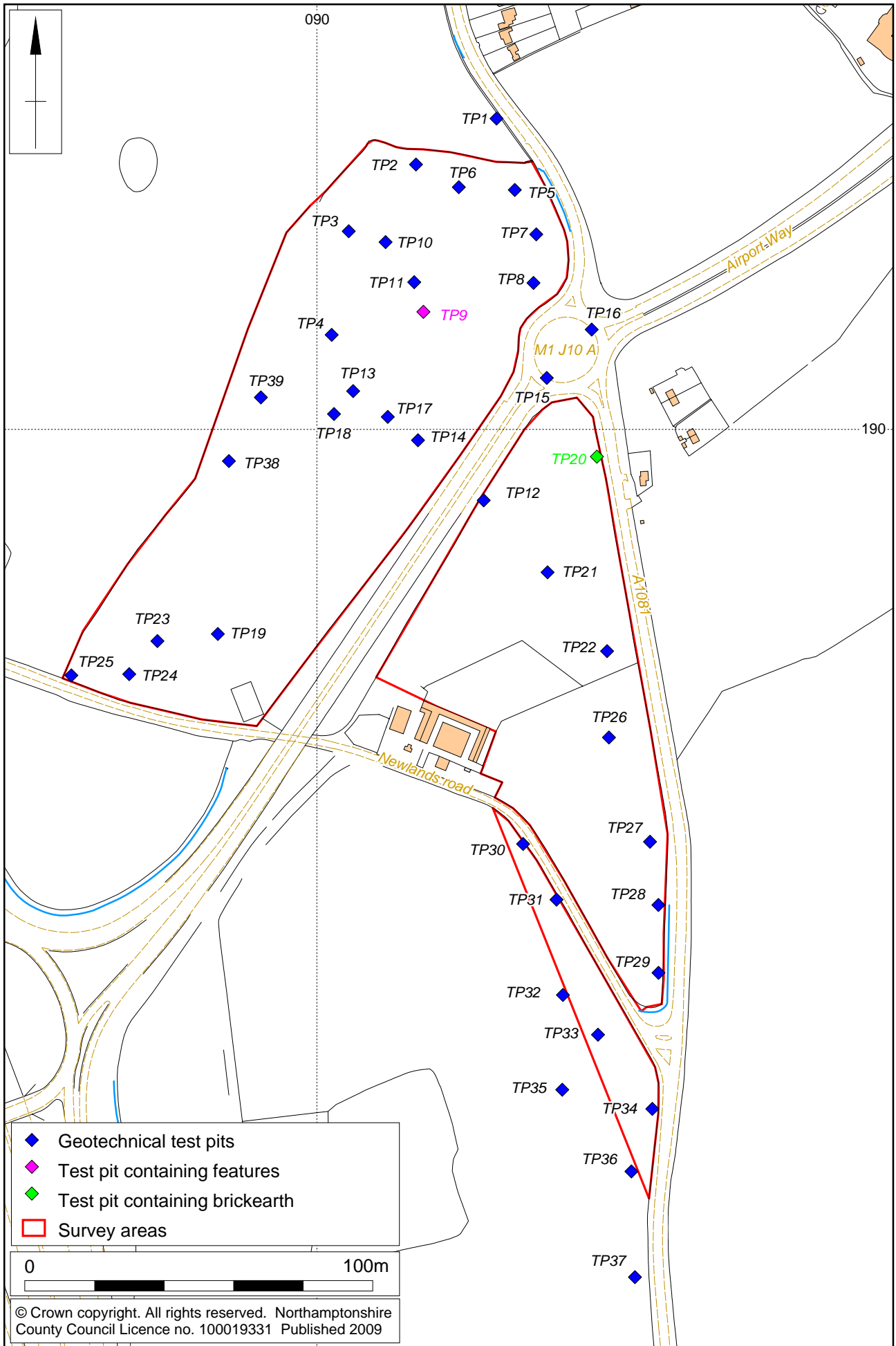
Section 3



Section 5



Sections 1-5 Fig 8



1:5000

Location of geotechnical test pits Fig 9



Trench 1, gully [105], looking south-east

Fig 10



Trench 2, pit [205], looking east

Fig 11



Trench 2, gully [207], looking west

Fig 12



Test pit 9, gully [905], looking west

Fig 13



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