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Northern Loop Road, Hall Lane, Staveley, Derbyshire: archaeological evaluation and watching brief 2006-8

Project No. 1504

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NORTHERN LOOP ROAD, HALL LANE, STAVELEY, DERBYSHIRE: ARCHAEOLOGICAL EVALUATION AND WATCHING BRIEF 2006-8

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SUMMARY

In 2006 Birmingham Archaeology was commissioned by Scott Wilson, on behalf of Derbyshire County Council, to carry out an archaeological evaluation by means of topographic survey, trial trenching and environmental sampling at Hall Lane, Staveley, Derbyshire. The site is located between the east bank of the River Rother and the former Chesterfield Canal and contained at least two ponds with associated earthworks. The purpose of the work was to establish the nature, extent and state of preservation of the ponds and any associated features, in advance of the proposed construction of the Staveley Northern Loop road.

A total of six trial trenches were excavated and an environmental auger survey was carried out. One cut archaeological feature, in the form of a small gully, was revealed and no finds were recovered. However, profiles of alluvial deposits were obtained which were more extensive than initially envisaged, perhaps indicating the presence of a large palaeochannel. Alluvial deposits recorded in one trench designed to investigate a possible third pond, to the south, probably represented the fill of the former palaeochannel rather than a pond. The other two ponds appeared to be located within the course of this earlier undated paleochannel and were shown to be earlier in date than the construction of the canal embankment in the 1770s, but their precise date and function remains uncertain. It is not certain that the ponds were used for rearing fish although this remains a strong possibility. Other possible functions suggested, including use as retting ponds for processing hemp or flax, appear to have been ruled out by the results of environmental analysis which found little direct evidence of human activity and suggested there had been a complex floodplain evolution at the site.

During 2007 an archaeological watching brief monitored the contractors groundworks at the northern part of the site in the area of two of the ponds. Due to the waterlogged conditions it was too hazardous to fully excavate the area. No archaeological finds were recovered from any of the deposits. A stone culvert probably associated with the canal was discovered running into one of the ponds. In 2008 a further watching brief was carried out at the northeastern part of the site to record the former Chesterfield Canal and any associated remains. The course of the canal was recorded and a section was excavated.

NORTHERN LOOP ROAD, HALL LANE, STAVELEY, DERBYSHIRE:

ARCHAEOLOGICAL EVALUATION WATCHING BRIEF 2006-8

1 INTRODUCTION

1.1 Background to the project

Birmingham Archaeology was commissioned by Scott Wilson on behalf of Derbyshire County Council (DCC) to undertake a programme of archaeological evaluation and watching brief at land on the proposed route of the Staveley Northern Loop Road, Staveley, Derbyshire (Planning Application Number CHE/0502/0312).

Interim reports on the results of the evaluation were prepared in 2007 and issued as appendices to a progress report issued to DCC. This final report outlines the results of the archaeological evaluation by means of topographic survey (conducted in September 2006), a programme of trial trenching and environmental sampling (undertaken during November 2006) and subsequent watching brief (carried out during 2007 and 2008). The report has been prepared in accordance with the Institute of Field Archaeologists Standards and Guidance for Archaeological Evaluations (IFA 2001).

The need for trial trench evaluation and environmental sampling was initially identified in the initial project design (Aspden 2006), and developed in consultation with Jim Williams of English Heritage and David Barrett, Archaeologist, Derbyshire County Council. The specification for the work was produced by Scott Wilson (2006), and this was approved by the Local Planning Authority prior to implementation in accordance with guidelines laid down in Planning Policy Guidance Note 16 (DoE 1990).

1.2 Location and geology

The site is located 0.5 km to the northwest of Staveley, Derbyshire, on low-lying ground between the east bank of the River Rother and the embankment of the former Chesterfield Canal to the south of Hall Lane. It is centred on NGR SK 43150 75050 (Figs. 1 and 2, hereafter referred to as 'the site').

The site lies on the Coal Measures of the North Derbyshire Coal Field. The underlying geology consists of sandstone and shale deposits, overlain by deposits of clay.

The site comprises a triangular shaped area (approximately 1,400m^2) of scrub ground at around 51.50m AOD. To the east of the site is the former Chesterfield canal, which has now been in-filled and is accessible as a public footpath. The embankment of the canal rises to a height of 5m above the site. The site is approximately 2m higher than the river to the east, which flows from south to north. Much of the lower lying vegetation had been cut down (prior to the topographic survey), however the remaining vegetation comprised of mature silver birch, hawthorn, willow and poplar trees. There are large sub-rectangular hollows or ponds containing water and reed-beds within the site.

2 ARCHAEOLOGICAL BACKGROUND

The place name Staveley derives from the Anglo-Saxon words *staef* (rod or stave) and *ley* (meadow) and is usually taken to mean the field where staves are grown. The settlement is listed as Stavelie in the Domesday Book of 1086. At the time of the Conquest the existing Saxon manor passed into the hands of the Norman knight Ascuit Musard. It was acquired

by the Frecheville family in the 16th century and by the Cavendish family in the 16th century. The historic site of Staveley Hall is on high ground overlooking the site next to the church. It is possible that construction and use of the ponds was connected in some way to the nearby manor.

The Chesterfield Canal was constructed between 1770 and 1777 and an embankment was built to carry the canal - at a considerable height above the level of the nearby river. This embankment now forms the eastern edge of the site and appears to partly overlie at least one of the ponds.

An archaeological desk-based assessment of the archaeology and cultural heritage of the Markham Employment Growth Zone, was carried out by Birmingham University Field Archaeology Unit (now Birmingham Archaeology) in 2002 (BUFAU 2002), but the site itself was not identified at this time. The desk-based research did not specifically look for evidence relating to the function and date of these features because the existence of the ponds was not known.

In 2006 a geophysical survey was carried out on land to the north of Hall Lane and on the west side of the River Rother (Fig. 2). The survey identified weak evidence for anomalies of archaeological origin, indicating possible cut features. However these anomalies may be areas of ground disturbance of relatively modern origin, possibly associated with the mineral railway nearby (Heard 2006).

3 AIMS AND OBJECTIVES

The principle aim of the evaluation was to determine the character, state of preservation and the potential significance of any buried remains. The watching brief aimed to rediscover the Chesterfield Canal and any associated archaeological features, to confirm the presence of a paleochannel at the location of the ponds and to further attempt to establish the function and date of the ponds.

More specific evaluation aims, as set out in the project specification, were to:

- Confirm the presence/absence of water management and earthwork features associated with the ponds initially identified by the topographical survey
- Establish the nature, extent and state of preservation of the ponds and any associated features
- Establish the presence/absence and state of preservation of any archaeological features that may not be apparent from the topographical survey
- Establish the presence/absence of deposits suitable for geo-archaeological and palaeoenvironmental assessment
- Establish the nature and state of preservation of any environmental remains present

4 TOPOGRAPHIC SURVEY

by Richard Cuttler

4.1 Methodology

The topographic survey was carried out using a Leica SR530 Differential GPS (base station and rover) to provide a close resolution topographic survey and to map visible features. A control point was established within open ground, away from physical obstructions, close to

the southern extent of the project area. This served as the "base station" for the duration of the survey. The base station (Leica SR530 receiver) logged data from the GPS satellite constellation and broadcast real time corrections to the SR530 rover. This allowed the collection of survey data providing a relative positional accuracy of ± 0.02m.

The vegetation within the project area varied considerably. Much of the area had been cut down prior to the commencement of the survey, and in these areas did not present any significant problems. This provided the opportunity to rapidly map thousands of spot heights using real-time kinematic survey. The rover can record X, Y, Z, data points at set time or distance intervals, the shorter the set period the greater the resolution, (and size) of the final data set. The rover was set to automatically log points at intervals of 0.5m and traverses were walked at distances of approximately 0.5m to provide an equal coverage of each area.

In areas where mature trees were present Satellite reception proved to be problematic. Here the GPS was used to put in fixed stations, which were then referenced using a Nikon EDM, so that points could be taken below areas of vegetation. Not all areas of the site could be accessed due to the presence of mature trees and vegetation (Fig. 3).

In addition to the EDM and GPS survey, a walkover of the study area was undertaken in order to interpret the nature of any above ground archaeological remains. On completion of the topographic survey all visible archaeological features were mapped using the SR530 rover. These mostly comprised the remains of possible ponds and associated features. Each archaeological feature was sequentially numbered, photographed and a brief description provided.

Points were collected in WGS84 latitude and longitude then converted to OSGB36 projected co-ordinate system using Leica SKI-Pro software. X, Y, Z, data points were exported from SKI-Pro as comma delimited files. This is a database format where each record is a single line and each field in the record is indicated by a comma (Comma-Separated Value). The data was then exported to Geosite and contours produced at a height separation of 0.3m. This was then exported to AutoCAD and combined with the base plan of the area.

4.2 Results

Features identified by the survey were interpreted as follows (see Fig. 3):

1. Bank aligned approximately southwest-northeast and located immediately to the east of the river. The bank slopes gently from west to east, and measures approximately 9m in width and 44m in length, surviving to a height of approximately 0.5m. It is possible that the bank is the result of dredging along the river, however this interpretation seems unlikely as dredging would more likely produce a bank along the entire edge of the river, which this is not. It seems likely that this bank is a water management feature relating to a pond (3).

2. Bank aligned approximately east-west and located between ponds (3 and 4). The bank measures approximately 0.5m in height, 17m in length and 9m in width. The feature is very clear, forming the northern extent of pond 3, and the southern extent of pond 4. At the western extent of the bank is a possible leat between ponds 3 and 4.

3. Southernmost of three ponds aligned approximately southwest-northeast. Measures approximately 45m in length and 14m in width. The western extent shares a bank with the river (1), while the eastern extent has been overlain by the later canal embankment (7). The southernmost extent of the pond appears to be at the southern extent of the survey, although this was not entirely clear. The most striking aspect of the pond is that, unlike the other two ponds (4 and 9), there is very little change in vegetation

compared to that on the banks. This suggests that the pond is free draining, unlike the ponds to the north which contain water loving plants within their interior.

4. This pond is clearly evident as both an earthwork, and as a change in vegetation compared to the gently-sloping surrounding banks. Aligned approximately southwest-northeast, the pond measures about 65m in length and 20m in width. Reed grass and mature willow trees define the extent of the interior which still contains standing water towards the middle. The eastern extent of the pond is clearly overlain by the later canal embankment (7) and consequently it's full extent cannot be determined.

5. Possible leat between ponds 3 and 4, evident as a curvilinear gully at the western extent of Bank (2). The leat is approximately 11m in length and measures 3m in width.

6. Shallow depression/hollow 0.1m in depth, possibly a pond, although the nature of the feature is not clear. The depression appears to be flat bottomed, measuring approximately 14m from north to south, and around 8m in width. Ovoid in plan, the feature possibly has an outlet into pond 3 at the southern extent.

7. Embankment for in-filled canal. Aligned approximately southwest-northeast along the eastern edge of the site. The embankment is approximately 5m high and appears to partially overlie ponds 3 and 4.

8. Bank aligned approximately east-west and located between ponds 4 and 9. The bank measures approximately 0.7m high, 20m in length and 9m in width. The feature is very clear, forming the northern extent of pond 4, and the southern extent of pond 9. At the western extent of the bank is a possible leat (10) between ponds (4 and 9), although it is very unclear and may be a result of a rise in the ground along the western edge of the site. The eastern side of the bank appears to be overlain by the canal embankment (7).

9. Northernmost of the three ponds, and possibly the best preserved. Evident as both an earthwork and as a change in vegetation compared to the gently-sloping surrounding banks. The pond is approximately 1.1m in depth and measures about 40m east to west, and 37m north to south. Water loving plants define the extent of the interior which still contains standing water towards the northern extent of the feature. The eastern extent of the pond appears to be overlain by the later canal embankment (7) and the northern extent is overlain by a road embankment.

10. Possible leat between ponds 4 and 9, evident as shallow depression at the eastern extent of Bank 8, however this feature is unclear, and may simply represent a break in slope between Bank 8 and an area to the west (11).

11. Fairly flat area of ground between the ponds and the river. No discernible features.

5 EVALUATION TRENCHES

5.1 Methodology

A total of six trenches were excavated to investigate the character and date of the earthworks identified in the topographic survey, and to test the provisional interpretation of the site, as a series of 'fishponds', made on the basis of survey results. Trenches were located in such a way as to best answer questions suggested by the survey results. The total area of trenching was 200m² (Fig. 4).

All topsoil and modern overburden were removed using a 360° tracked mechanical excavator with a 2m wide toothless ditching bucket, under direct archaeological

supervision, down to the to the top of the uppermost archaeological horizon or the subsoil. Subsequent cleaning and excavation was by hand.

All stratigraphic sequences were recorded, even where no archaeology was present. Features were planned and sections of all trenches were drawn at a scale of 1:50. Sections through cut features and selected segments of trench sections were drawn at a scale of 1:10. A comprehensive written record was maintained using a continuous numbered context system on *pro-forma* context and feature cards. Written records and scale plans were supplemented by photographs using monochrome, colour slide and digital photography.

A series of core soil samples were taken at the same time as the excavation of evaluation trenches. The methodology and results of that part of the investigation is described in Section 6 of this report.

The full site archive includes ecofactual remains recovered from the site (there were no artefacts recovered). The site archive will be prepared according to guidelines set down in Appendix 3 of the Management of Archaeology Projects (English Heritage, 1991), the Guidelines for the Preparation of Excavation Archives for Long-term Storage (UKIC, 1990) and Standards in the Museum Care of Archaeological collections (Museum and Art Galleries Commission, 1992). Finds and the paper archive will be deposited with Derbyshire Museums Service, subject to permission from the landowner.

5.2 Results

Introduction
Detailed summaries of the individual trenches are presented in Appendix 1 and full details are available in the project archive. In the following sections both feature (cut) and context numbers are highlighted in bold. Contexts were numbered according to the number of the trench: thus contexts in Trench 1 start from 1000, contexts in Trench 2 start from 2000, and so on. See Figures 5 and 6 for plans and sections.

The results of excavation are described here on a trench-by-trench basis. Note that some aspects of the interpretation of earthworks based on site survey are revised here to take account of the excavated evidence. Refer to Figure 4 for trench locations.

Trench 1
Trench 1 (Plate 2) was positioned to examine the nature of the 'bank' (2) between ponds (3 and 4). It was not possible, however, to excavate the fill of the ponds as intended, due to large amounts of standing water. The trench was 15m long and 2m wide, with a maximum depth of 0.8m.

A convex surface of light brown natural clay **[1004]** was encountered at a depth of about 0.5m. This is understood to represent a 'natural' deposit, in the sense that although probably alluvial in origin it pre-dates the construction of the ponds. Contingency exploration of this layer with the machine provided no evidence that it was heaped up in the form of a bank as initially thought: rather it appears that its convex shape was created by the digging of hollows on either side cutting into what was essentially a pre-existing layer. A similar deposit in Trench 3 was shown to be of natural origin (see below).

Several possible features cut into the surface of layer 1004 were examined, only one of which proved to be archaeological. This was narrow gully **[1006]**, running E-W (Plate 3) and filled with a mid brown silty clay **[1005]**. No finds were recovered so this feature remains undated.

Also cutting 1004, to the north, was the southern edge of rectangular pond (Plate 3) **[1002]**, filled by a waterlogged dark brown silty clay deposit **[1003]**.

Overlying the clay 1004 and the pond fill 1003 was the light brown silty clay subsoil **[1001]**, which was overlaid in turn by topsoil **[1000]**.

A contingency extension was added to Trench 1 on its eastern side, running up to the edge of the canal embankment. This confirmed that the material **[1007]** comprising the embankment was much later than the ponds. It overlay the subsoil 1001, which itself overlay the pond fill 1003. This is significant in that it shows that the construction of the ponds took place prior to the late 18th century, with some intervening time indicated by the build-up of subsoil.

Trench 2
Trench 2 was positioned in order to investigate the possible leat (10) connecting the corners of ponds (3 and 4). It was 10m long and 4m wide, with a maximum depth of 1.1m. In the south eastern corner of the trench, the light brown natural clay **[2003]** forming the western edge of the 'bank' (2) was found, sloping gently down southwards and westwards towards the river beneath laminated alluvial deposits of silty clay **[2002]**. There was no below ground evidence of a leat, and no cut features were encountered. Both 2003 and 2002 were sealed by mid brown silty clay subsoil **[2001]**, which was overlaid by modern topsoil **[2000]**.

Trench 3
Trench 3 (Plate 1) was orientated roughly E-W across what was assumed to be pond 4. It was 15m long and 2m wide, excavated down to a maximum depth of 1.2m. Instead of the anticipated pond depression with sloping sides to the west, a gently sloping natural layer **[3007]**, sloping down from east to west, was encountered at the eastern part of the trench. The natural mid brown clay **[3007]** was similar to the lighter clay **[1004]** encountered in Trench 1. It was associated with a sandstone outcrop **[3008**, not illustrated**]**. At the point where 3007 and 3008 met was a linear natural feature **[3004]**, which contained a mid yellow clay silt **[3005]** and a mineral deposit of compact black shale-like fragments as part of its upper fill **[3006]**. This feature was important in that it confirmed the natural character of the underlying clay 3007.

Overlying these natural layers were a series of silty clay laminated alluvial layers - given the composite number **[3002]**. These deepened towards the present course of the river and are thought to represent former river (rather than pond) deposits. There were no finds.

Above 3002 was the mid yellowish brown silty clay subsoil **[3001]**, which was overlaid by modern topsoil **[3000]**.

Trench 4
The purpose of Trench 4 was to investigate the bank (8) between ponds (4 and 9). However, due to the presence of large amounts of standing water in both ponds the excavation of this trench was abandoned and no archaeological observation or recording was possible.

Trench 5
Trench 5 was positioned in order to investigate the relatively flat ground (11) between the ponds and the river in the northwest part of the site. The trench was 20m long and 2m wide, with an average depth of 1m (the presence of groundwater made further excavation impossible). No natural layer was encountered. The earliest deposit was a mixed layer of mottled reddish brown silty clay **[5002]** which extended downwards beyond the base of the trench. Above this was a mid brown silty clay subsoil **[5001]** which was relatively thick, up to 0.4m deep, below the topsoil **[5000]**. There were no finds recovered from these deposits.

Trench 6
Trench 6 was sited partly over the shallow depression (6). It was 15m long and 2m wide, and excavated down to a depth of 1.2m. No below ground evidence of earthworks was found here. Instead there was a considerable depth of horizontally-laid alluvial deposits (Plate 4) along the entire length of the trench. These were given the composite context number **[6003]**. Above these was a mid brown silty clay subsoil **[6002]**. Above the subsoil was a thin organic charcoal-rich layer of black silty clay **[6001]** which is assumed to be of fairly recent origin. Above this was the modern topsoil **[6000]**. There were no finds.

6 WATCHING BRIEF

By Elisabeth Bishop

6.1 Methodology

The watching brief was carried out between August 2007 and February 2008. The northern part of the site was subject to removal of overburden using a tracked 360° mechanical excavator with a 2m wide toothless ditching bucket monitored by a qualified archaeologist.

All stratigraphic sequences were recorded, even where no archaeology was present. Features were planned using an EDM and sections were drawn at a scale of 1:50. A comprehensive written record was maintained using a continuous numbered context system on *pro-forma* context and feature cards. Written records and scale plans were supplemented by photographs using monochrome, colour slide and digital photography.

6.2 Results

6.2.1 Ponds (features 4 & 9)

At the northern part of the site, in the area of the pond features 4 & 9 (Fig. 7) drainage trenches were excavated on the northern edge of the site adjacent to Hall Lane and east of the pond features at the base of the former canal embankment (Feature 7). These trenches were dug to a depth of 1.50-2.00m in order to drain standing water into the river and allow excavation in the area of the ponds. The deposits recorded in these trenches were similar to those subsequently recorded (below).

The earliest layer encountered in this area of the site was a mid to dark grey clay **[101]**, 2.0m deep (Plate 5), which was darker nearer the current ground surface. Layer 101 sloped downwards towards the river and appeared to be of alluvial origin. Overlying this layer, but only in part of the site was a light brown orange sandy clay deposit **[102]**, 0.15m-0.45m deep. Deposit 102 was probably re-deposited natural associated with bank 8 (Fig. 3) and appeared to separate pond features 9 and 4. Layer 101 was overlaid by a dark brown waterlogged silty clay deposit **[103]**, 1.0-1.50m deep, forming the pond fill which also abutted deposit 102. Also close to the canal embankment within layer 101 was a of light beige crushed stone, gravel **[105]** and brick fragments (Plate 7), probably a dumped deposit. Due to health and safety issues the depth of 105 could only be estimated at over 0.50m. To the east the canal embankment (feature 7, Fig. 3), was made of a mid orange silty clay **[106]**. Cutting 106 at the base of the embankment was a northwest-southeast orientated culvert **[104]** (Plate 6), 0.6m wide, which terminated at the eastern edge of pond feature 4 (Fig. 7). Culvert 104 was made of various sized stone slabs. Sealing all these layers was a dark brown silt organic layer with roots **[100]**, varying between 0.20-0.40m deep. The waterlogged conditions made it hazardous and time consuming to excavate the area fully (Plate 8). Therefore it was decided to halt groundworks and backfill the area.

No datable finds were recovered from any of these contexts.

6.2.2 Former Chesterfield Canal (feature 7)

The course of the former canal (Fig. 8) was located to the east of the river and the pond areas. Here the natural terrain slopes down toward the river and the area west of the line of canal has been embanked. As expected the Chesterfield Canal was discovered (Plate 9). A section was cut through the canal using a tracked 360° mechanical excavator (Fig. 9, Plate 10).

The earliest deposit encuntered in this area was mid yellow clay **[210]** 1.65m below the current ground level. Cutting layer 210 was the primary cut for the canal channel **[207]** containing a dark brown or black sandy silt **[206]**, 1.10m deep. This appeared to be recut **[204]**, 10.20m wide and 2.50m deep, with moderate to steep sides and with a bowl-shaped profile. The primary fill of channel 204 was a mid green sandy clay **[203]**, 0.50m deep. This was overlain by a black clayey silt **[202]**, 2.00m deep, containing sherds of 19th century pottery. Overlying fill 202 at the edges of the channel was a mid brown red pea grit deposit **[205]**, 0.50m wide and 0.40m deep. This may possibly be associated with a former canal kerbing, perhaps made of stone, now robbed out. Sealing fill 202 was a deposit of dark yellow sandy clay **[201]**, 1.0m deep, probably re-deposited natural. Overlying this was a mid orange brown sandy clay **[211]**, 1.20m thick. This was sealed by a mid brown silty sand topsoil **[200]**, at least 0.40m thick.

7 FINDS

7.1 The pottery by Stephanie Rátkai

Fill 202, cut 204

- Virtually complete pale grey stoneware cylindrical jar dating to the ?later 19th century.
- Four sherds from a patent medicine jar in utilitarian whiteware dating to the ?later 19th century.
- Industrial slipware jug sherd, white ground with blue slip bands dating to the 19th century.
- Six sherds from a dark blue transfer-printed plate (ironstone body?). Second half of the 19th century.
- Two sherds from a ?19th century whiteware plate with pale brown transfer-printed design.
- Seven small undiagnostic 19th century whiteware sherds.

8 ENVIRONMENTAL SAMPLING By Dr Emma Tetlow and Dr Ben Geary

8.1 Aims

The initial geo-archaeological assessment had six aims (Scott Wilson 2006):

- Determine the depths of the ponds.

- Identify, where possible, the depositional sequence within the ponds and characterise the sediments that constitute this sequence.
- Outline recommendations for sub-sampling to provide dating evidence relating to the ponds and their depositional sequence.
- Outline recommendations for sub-sampling and assessment of palaeoenvironmental remains.
- To relate the sequence to current local and regional models.
- To inform the need and strategy for a further programme of sampling, if necessary.

8.2 Methods

A gouge auger survey was undertaken at key points across the site (Fig. 3) to establish the depth of the deposit, site stratigraphy and recover suitable samples for palaeoenvironmental analysis and environmental reconstruction. The auger survey was hampered by standing water in both 'pond' features, which varied in depth from viscous mud to tens of centimetres of standing water. This precluded meaningful coring in either feature, as it was difficult to tell in all but one case (core 1) whether or not the chamber was penetrating the desired hole.

8.3 Auger survey results

The detailed results of the auger survey are presented in Appendix 2.

Stratigraphy and Sedimentology

Core 1 & 2 - Pond 9

A complete section of the pond stratigraphy was collected from Core 1 and has been retained for detailed sedimentological and environmental analysis, a full description of this core will be presented is presented below. The uppermost contexts from Core 2 consist of a 0.30m deposit glutinous detrital mud, which contains the poorly decayed remains of reed sweet grass (*Glyceria* spp.). Beneath this, to a depth of 1m is a black, organic rich deposit. The upper 0.2m is composed of silty clay with fine-grained sand; beneath this the deposit is richer in clay. At 0.9m this trends into pale yellow/grey clay, giving way to stiff, buff coloured clay, which is present across much of the site at a depth of 1m.

Core 4 & 5 – Pond 4

Core 4 and 5 proved the most problematic to extract due to the depth of standing water and the dense tussocks of reed sweet grass which cover this area of the floodplain. A sample, possibly complete, was extracted from core 4, stratigraphy was similar to that in cores 1 and 2, detrital mud, containing fragments of sweet grass and fine grained sand (0-0.23m) overlay 1.62m of organic silt, between 0.23m and 0.54m the deposit contained wood and rhizomes. Below 0.54m the deposit was composed of homogeneous organic rich, silty clay, which gave way to pale grey alluvium at 1.85m. It is difficult to establish whether or not this depth represents the actual depth of deposit, due to the difficulties of excavating boreholes in standing water. Similar problems were experienced when extracting core 5. However, the stratigraphy of this core is similar to that of Cores 1 & 2, the organic deposit reaches 1.3m before giving way to stiff, buff coloured clay. The upper part of this unit (0.34-0.67m) contains medium grained sand, which becomes finer between 0.67-0.80m; the lower unit is composed of smooth, organic rich silts and clays.

Cores 3, 6, 7 & 8

All four cores were recovered from a river terrace-like feature, which bounded the current, canalised channel of the River Rother. All four sequences were capped by a deep, dark brown peaty topsoil which was 0.8-1m deep. The consistency of this topsoil varied in depth

between each core and included possible burning (Core 6, 0.5-0.6m) and prolific iron pan (Core 8, 0.75-0.85m). Distinct bands of clay-rich topsoil were recovered from between 0.60-0.80m in core 6 and 7. Both of these cores appear to relate to topographic depressions in this possible terrace feature. The peaty soil is replaced by grey clay (0.80m-1m) before giving way to brown, buff or yellow/brown clay (1m-1.3m). To establish the stratigraphy below the depth of archaeological interest, Cores 3 and 6 were excavated to the alluvial sands and gravels. Above the sands and gravels in Core 3, 0.3m of grey alluvium was observed, overlain by 0.5m of buff coloured sand. The stratigraphy of Core 6 consisted of grey alluvium 1.9m deep, directly overlying the sands and gravels, which were reached at a depth of 2.1m and 2.2m respectively.

Discussion

The geomorphology at the site is reminiscent of a palaeochannel complex. The hachure survey has highlighted a series of terrace-like features which appear to be truncated by the modern river channel to the north, but which slope gently down to the linear depressions to the south. It is possible that the 'pond' features are a relict palaeochannel, which meandered across the floodplain, constrained by the escarpment, which rises to the east and which have been subject to significant anthropogenic manipulation during the medieval/post medieval period. Unravelling the fluvial architecture and geomorphology of the site has been compounded by extensive anthropogenic modification during the late post-medieval period. Significant modification of the floodplain was a result of construction works associated with the Chesterfield Canal, which follows the line of the escarpment to the east. The canal is elevated above the modern floodplain and sits upon an embankment. The River Rother itself has been canalised, probably part of construction works for the industrial estate which lies to the west of the river's current channel.

The sedimentology does suggest that the features have been subject to influxes of flowing water; organic rich silts and clay with medium and fine-grained sand were recorded from cores extracted from both the upper and lower pool. The stratigraphy of Core 5 is perhaps the most instructive, with a lower unit that contained fine-grained sand giving way to an upper unit, which contained medium sand. This clearly indicates a changing flow regime and fluvial activity, which is probably an episode of channel re-activation, perhaps a result of flood events or deliberate management of the water within feature.

Across the drier areas of the site, the topsoil is dark brown, almost black and organic rich, equivalent to an earthy peat topsoil (Avery 1980, Clayden and Hollis 1984). The highly organic nature of this soil, and the not insignificant depth (between 0.80m and 1m) clearly suggests a large area of wetland once occupied the site.

Conclusions and further work

The most likely hypothesis is that the 'fishpond' features at Staveley are set within a palaeochannel complex of the River Rother. The river has clearly been modified in the recent past and the impact, if any, of such modifications is unclear on the basis of the current data. Whilst the current interpretation is that the features are 'fishponds', other feasible possibilities include:

- Retting pits, for wool or hemp. Similar features may be seen in similar landscape contexts across north western Britain (Gearey *et al.* 2005, Higham 1989)
- Osier beds, which require regular management and were a common feature of floodplains during the medieval and post medieval period (Rackham 1986).

A clear understanding of floodplain evolution at this site, a timeframe for development and establishing any degree of anthropogenic modification of the site is essential. With this in mind, the following approach was recommended:

- Assessment of Core 1 or 2:
  - Pollen analysis:
    - Assessment of potential from single samples from the top and bottom of the core, two samples from the middle of the core at 0.4m intervals.
  - Insect and waterlogged plant remains:
    - Assessment of potential (presence/absence, preservation, subjective assessment of seeds/sclerites present) of samples from the top, middle and bottom.

8.4 Core 2 Palaeoenvironmental Assessment

Samples were collected from Core 2, which contained material deemed to have the most potential for palaeoenvironmental assessment. Four samples for pollen assessment were recovered (1.2m, 0.9m, 0.55m and 0.2m). Five samples, at 0.20m depths were assessed for pollen and waterlogged plant remains (1-1.3m, 0.8-1m, 0.6-.8m, 0.4-0.6m, 0.2-0.4m). Preparation of this material for each form of proxy evidence (pollen, insect, waterlogged plant) followed the standard procedures outlined below:

Pollen
Six samples were submitted for pollen analysis from Core 1, Transect 1 (Table 1) and Core 2, Transect 2 (Table 2). Pollen preparation followed standard techniques including KOH digestion and acetylation (Moore *et al*., 1991). Pollen nomenclature follows Moore *et al.* (1991), with the modifications suggested by Bennett *et al.* (1994). Low numbers of pollen grains precluded calculation of percentages and hence records were made of presence and relative abundance only.
Insects
Bulk samples were processed for Coleopteran remains using the standard method of paraffin flotation as outlined in Kenward *et al.* (1980). The resultant paraffin flot was then sorted and identified where possible under a low power (x10) binocular microscope. The system for "scanning" faunas as outlined by Kenward *et al.* (1985) was followed for this assessment.

Waterlogged Plant Remains
Bulk samples were processed for waterlogged plant remains using the standard method of Kenward *et al.* (1980). The resultant flot was then sorted and identified where possible under a binocular microscope. The system for "scanning" such material as outlined by Kenward *et al.* (1985) was followed in this assessment.

Each proxy was assessed on the basis of:
- Relative abundance.
- Presence/absence.
- Rapid identification of each taxon present.
- Environmental implications.
- Potential for further work.

Sedimentology
Core 2, sedimentary details are presented in Table 1. This core was subject to detailed sedimentological analysis and environmental assessment.

Biostratigraphy: pollen, insects and waterlogged plant remains

Material was assessed for waterlogged plant, pollen and insect remains. The results are listed in Table 2.

Core 2		
Depth	**Description**	**Samples**
0.2-0.35m	Dark grey, fine grained, organic rich, clayey silt	Pollen .2m Insect, waterlogged plant 0.2-0.4m
0.35-0.45m	Dark grey, fine grained, clayey silt	Insect, waterlogged plant 0.2-0.4m/0.4-0.6m
0.45-0.47m	Medium coarse sand	Insect, waterlogged plant 0.4-0.6m
0.47-0.54m	Dark grey, fine grained, organic rich, clayey silt	Insect, waterlogged plant 0.4-0.6m
0.54-1.04m	Dark grey, fine grained, clayey silt	Pollen 0.55m/0.9m Insect, waterlogged plant 0.4-0.6m/0.6-0.8m/1-1.2m
1.04-1.12m	Pale grey, stiff, silty clay	Insect, waterlogged plant 1-1.2m
1.12-1.2m	Grey silty clay	Pollen 1.2m Insect, waterlogged plant 1-1.2m

Table 1: Sedimentology of Core 2.

Discussion

This assessment has clearly demonstrated the environmental potential of this deposit. Pollen, insect and waterlogged plant data suggest that throughout deposit formation, the linear features were surrounded by open grassland, colonised by herbaceous taxa, such as goosefoot (*Atriplex* spp.), clover (*Trifolium* spp.) and plantains (*Plantago* spp.). Whilst the landscape was evidently quite open near to the sampling site, the pollen data suggest some woodland nearby, with reasonably high counts of arboreal taxa, relative to the total pollen count, recorded at 0.2m and suggesting oak (*Quercus* spp.) woodland nearby, with other trees including birch (*Betula* spp.), elm (*Ulmus* spp.) and alder (*Alnus glutinosa*).

The results of this assessment also suggest that this feature was neither a retting pit nor osier bed. Large concentrations of *Cannabis*-type pollen and achenes would have been anticipated in the samples had the feature been used for this function (Gearey *et al*., 2005). Similarly, had osiers (*Salix vimnalis* and *S. triandra*), been grown on a commercial scale at the site, high counts for willow (*Salix* spp.) pollen and/or vegetative remains of this taxon would have been expected, but this is not observed.

Sample Depth	Preservation			Abundance			Ecological Implications
	Pollen	Insects	Plant Remains	Pollen	Insects	Plant Remains	
1.00-1.2m Pollen spot 1.2m		Excellent	Good	Absent	Limited	Limited	Both insect and waterlogged plant remains are indicative of grassland or pasture. The Curculionidae or 'weevils' *Apion* and *Sitona* spp. both feed upon vetches (*Vicia* spp.) and other leguminous taxa such as clover (*Trifolium* spp.) and wild peas (*Pisum* spp.). Several grass seeds (Poaceae) were found.
0.8-1m Pollen spot 0.9m		Absent	Good	Limited	Absent	Limited	No insects were recovered from this sample. The plant remains are associated with disturbed grassland environments with some evidence of trees. Seeds from goosefoot (*Atriplex* spp.), grasses and birch (*Betula* spp.). Poaceae (wild grass) pollen.
0.6-0.8cm		Poor	Excellent		Limited	Limited	Herbaceous taxa indicate disturbed grassland. The insects recovered from this sample provide limited information on the environment and vegetation at the site.
0.4-0.6m Pollen spot 0.55m		Good	Excellent	Limited	Limited	Abundant	Waterlogged plant remains indicate damp, tussocky vegetation composed of grasses and sedges, probably similar to floodplain vegetation today. *Chenopodium* pollen.
0.2-0.4m Pollen spot 0.2m		Excellent	Good	Limited	Limited	Limited	A relatively diverse coleopteran assemblage was recovered from this sample. They suggest damp environments with rotting vegetation. The limited numbers of seeds in this sample are from grasses and birch trees. Poaceae, *Quercus*, *Betula* and *Alnus* and *P.lanceolata* pollen.

Table 2: An assessment of the insects, plant and pollen evidence from Staveley

Conclusion

Despite the reasonable preservation of environmental remains in the deposits, the exact age and purpose of these features remains ambiguous. Whilst two possibilities (retting, osier beds) for the function of the 'ponds' have apparently been ruled out, how or why they were constructed remains unclear. The environmental data indicates that the deposits accumulated in a generally open floodplain environment with very little direct evidence for human activity. It still seems possible that these features at Staveley are part of a natural palaeochannel complex of the River Rother. The river has clearly been modified in the recent past but the impact, if any, of such modifications is unclear on the basis of the current data. It seems unlikely that further analysis will shed any further light on these issues and no further work is therefore recommended.

9 DISCUSSION

The trial trenching was only of limited value in exploring ponds features 4 and 9, which were waterlogged, and bank feature 8 between them. There were no artefactual finds from the trial trenching and only one cut feature was encountered, in the form of a small gully in Trench 1. The trenching was therefore unable to establish the date of the ponds, apart from confirming that they predate the construction of the canal embankment in the late 18th century.

A significant finding from Trenches 1 and 3 was that a band of 'natural' (pre-pond) clay and some outcropping of sandstone is to be found at a relatively high level in the southeastern part of the site. This clay forms a bank on the south side of pond feature 4, (Fig. 3), but it was concluded that this had been formed by the cutting away of features rather than the building up of redeposited material. The surface of the clay sloped down markedly towards the west, dipping below extensive alluvial deposits, but there was no sign of the eastern edge of pond feature 3. Alluvial deposits in Trench 3 may represent the fill of a former palaeochannel rather than a pond.

Similarly the features identified by the topographical survey in the southwestern part of the site were not reflected in the stratigraphy revealed by trenches. There was no confirmation of the existence either of the possible leat feature 5 or the shallow depression feature 6. The flat ground (feature 11, Fig. 3) between the ponds and the river may represent a terrace around which a palaeochannel flowed, and it is likely that the ponds were themselves constructed within an existing and partially filled up palaeochannel. The environmental sampling found little direct evidence of human activity and suggested there has been a complex floodplain evolution at the site.

The watching brief did not provide any further evidence regarding the date and/or function of the ponds, and a culvert and dumped material recorded during the watching brief appears to be associated with the Chesterfield canal to the east. While the existence of associated features has not been substantiated by excavation, what remains certain is that there are two rectangular ponds of pre- late 18th century origin which are well-defined and still hold water, though partly truncated by the canal embankment. These ponds may have had a system of sluices and leats feeding water out of and back into the river, the present canalised course of which is almost certainly not the one associated with the ponds. With regard to function, it is by no means certain that the ponds were used for rearing fish although this remains a strong

possibility. Other possible functions suggested, including use as retting ponds for processing hemp or flax, appear to have been ruled out by the results of the environmental analysis.

The watching brief also recorded the course and profile of the Chesterfield Canal, although no associated features other than a culvert were revealed. The Chesterfield Canal constructed between 1770-1777 was one of the earliest constructed by James Brindley and the profile recorded demonstrates its typical "pioneering" qualities of being narrow and simple to build (Crowe 1994, 21). The canal was reportedly backfilled in the 1970s.

10 ACKNOWLEDGEMENTS

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APPENDIX 1: CONTEXT DESCRIPTIONS (EVALUATION)

Trench 1

Context	Type	Description	Width	Thickness /Depth
1000	layer	dark brown-black silty clay, topsoil	2.00m	0.30m
1001	layer	light brown silty clay, subsoil	2.00m	0.20m
1002	cut	cut of sub-rectangular pond	2.00m	0.35m
1003	fill	dark brown-black silty clay, fill of pond	2.00m	0.35m
1004	layer	light brown clay layer, 'natural'	2.00m	UNEX
1005	fill	mid brown silty clay, fill of gully	0.60m	0.18m
1006	cut	cut of small shallow E-W gully	0.60m	0.18m
1007	layer	dark brown silty clay, canal embankment	2.00m	0.30m

Trench 2

Context	Type	Description	Width	Thickness
2000	layer	dark brown-black silty clay, topsoil	4.00m	0.25m
2001	layer	mid brown silty clay, subsoil	4.00m	0.30m
2002	layer	dark brown-black silty clay, alluvial layer	4.00m	0.40m+
2003	layer	light brown clay layer, 'natural'	2.00m	UNEX

Trench 3

Context	Type	Description	Width	Thickness
3000	layer	dark brown-black silty clay, topsoil	2.00m	0.30m
3001	layer	mid yellowish brown silty clay, subsoil	2.00m	0.30m
3002	layer	dark brown-black silty clay	2.00m	0.40m
3004	cut	cut of linear feature, probably natural	1.00m	0.25m
3005	fill	mid yellow brown clay silt, fill of linear	1.00m	0.15m
3006	fill	dark black mineral deposit, fill of linear	1.00m	0.10m
3007	layer	mid brown clay, alluvial 'natural' layer	2.00m	UNEX
3008	layer	sandstone outcrop in clay matrix, natural	2.00m	UNEX

Trench 5

Context	Type	Description	Width	Thickness
5000	layer	dark brown black, topsoil	2.00m	0.25m
5001	layer	mid brown silty clay	2.00m	0.35m
5002	layer	mottled layer of reddish-brown silty clay	2.00m	0.40m+

Trench 6

Context	Type	Description	Width	Thickness
6000	layer	dark brown-black silty clay, topsoil	2.00m	0.30m
6001	layer	thin dark black layer, some charcoal	2.00m	0.10m
6002	layer	mid brown silty clay, subsoil	2.00m	0.15m
6003	layer	successive laminations of alluvial deposits	2.00m	0.50m+

APPENDIX 2: AUGER SURVEY RESULTS

Depth (m)	Description	Comments	Depth (m)
Core 1			Selected for detailed analysis and environmental sampling
Core 2	0.00 -0.03m	Lost	Heavily waterlogged, predominantely composed of decaying organic material
	0.03-0.05m	Brown/black detrital mud	
	0.05-0.07m	Silty, organic rich mud with some medium sand	
	0.07-0.09m	Black, organic rich clay	
	0.09-1.00m	Pale yellow/grey clay	
	1.00m+	Stiff, buff coloured clay	
Core 3	0.00-0.04m	Dark brown, peaty topsoil	
	0.04-0.96m	Iron rich layer	
	0.09-1.00m	Dark brown peaty soil with prolific iron pan	
	1.00-1.30m	Stiff, dark grey silty clay	Alluvium
	1.30-1.80m	Buff clay	
	1.80-1.90m	Blue grey clay with abundant, black organic material	
	1.90-2.10m	Pale grey silty clay	Alluvium
	2.10m+	Sands and gravel	
Core 4	0.00-0.23m	Detrital mud with some fine grained sand	Heavily waterlogged, predominantely composed of decaying organic material
	0.23-0.54m	Silty, organic rich clay with rhizomes and wood	
	0.54-1.85m	Black, clayey organic rich silt.	
	1.85m+	Pale grey alluvium	
Core 5	0.00-0.25m	Lost	Standing water, deposit predominantely composed of decaying organic materia
	0.25-0.34m	Detrital mud	Heavily waterlogged, predominantely composed of decaying organic material
	0.34-0.67m	Organic rich silt with abundant medium grained sand	
	0.67-0.80m	Organic rich silt with some fine grained sand	
	0.80-1.30m	Blue grey clay with abundant black organic material	Alluvium
	1.30-1.80m	Buff clay	
Core 6	0.00-0.45m	Dark brown, peaty topsoil	

	0.45-0.50m	Clay rich lense of similar dark brown topsoil	
	0.50-0.60m	Black, friable material	• Charring? • Well humified peat? • Palaeosol?
	0.60-0.80m	Clay rich, dark brown topsoil	
	0.80-1.00m	Dark grey clayey silt	
	1.00-1.30m	Brown clayey silt	
	1.30-1.65m	Pale grey clay	Large fragment of charcoal at 1.55m
	1.65-1.90m	Stiff, blue grey clay	
	1.90-2.20m	Pale grey clay	
	2.20m+	Sands and gravel	
Core 7	0.00-0.75m	Dark brown, peaty topsoil	
	0.75-0.85m	Clay rich lense of similar dark brown topsoil	
	0.85-0.90m	Stiff buff clay with gravel inclusions	
	0.90-1.40m	Stiff, pale brown, gritty clay	1.60m Large piece of charcoal
Core 8	0.00-0.75m	Dark brown, peaty topsoil	
	0.75-0.85m	Dark brown peaty soil with prolific iron pan	
	0.80-0.96m	Dark grey clayey silt with iron pan	
Core 8	0.96-1.00m	Pale grey clay with iron pan	
	1.00m+	Stiff, buff coloured clay	


Site
STAVELEY
Renishaw
Eckington
Killamarsh
Spinkhill
Barlborough
Clowne
Mastin Moor
Woodthorpe
Nethertmorpe
Duckmanton
Inkersall
Arkwright Town
Long Duckmanton
Shuttlewood
Shuttlewood Common
Woodside
Oxcroft
Stanfree
Barlborough Common
Renishaw Park
Opencast Workings
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Licence No. AL 51303A

Fig.1

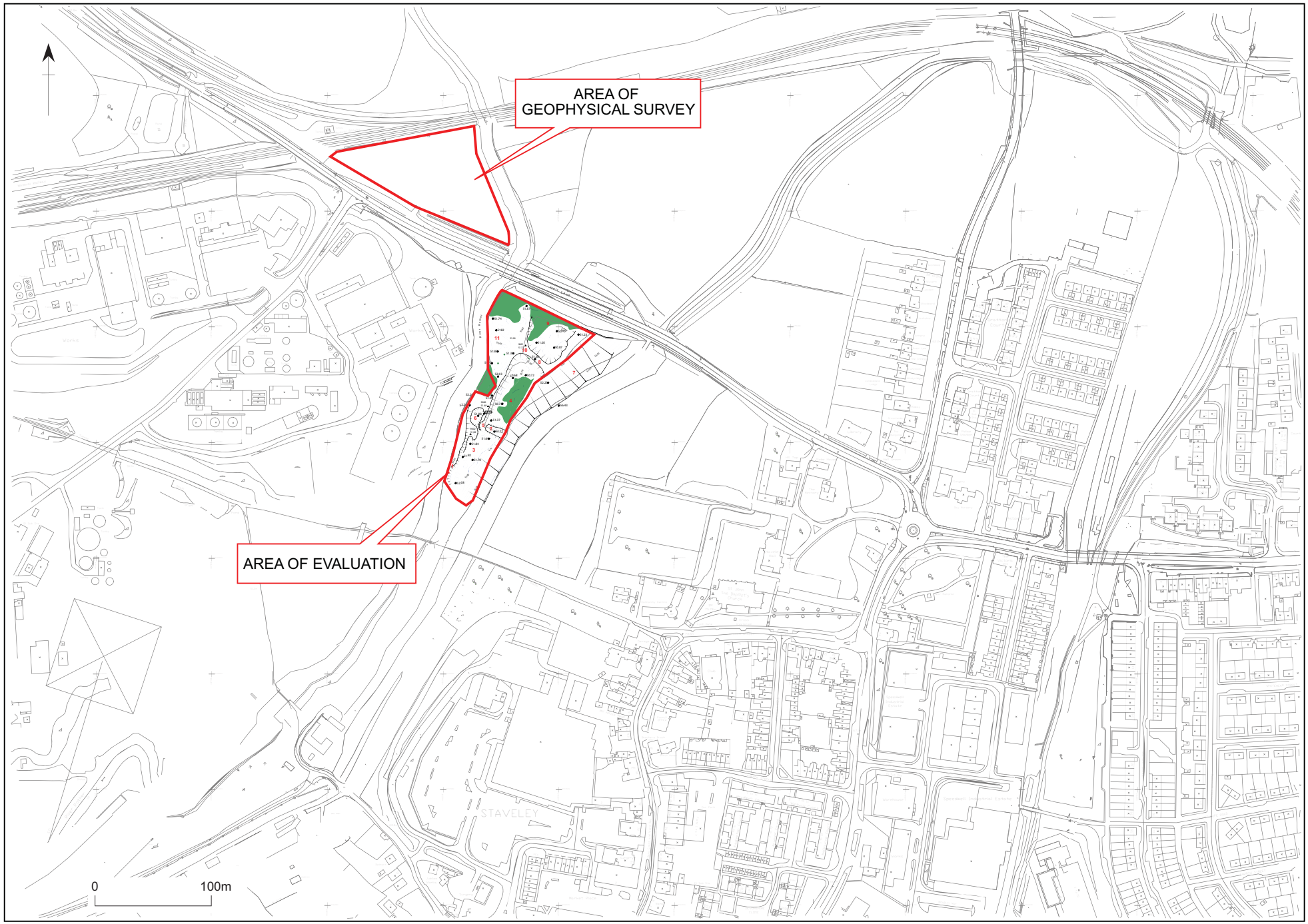
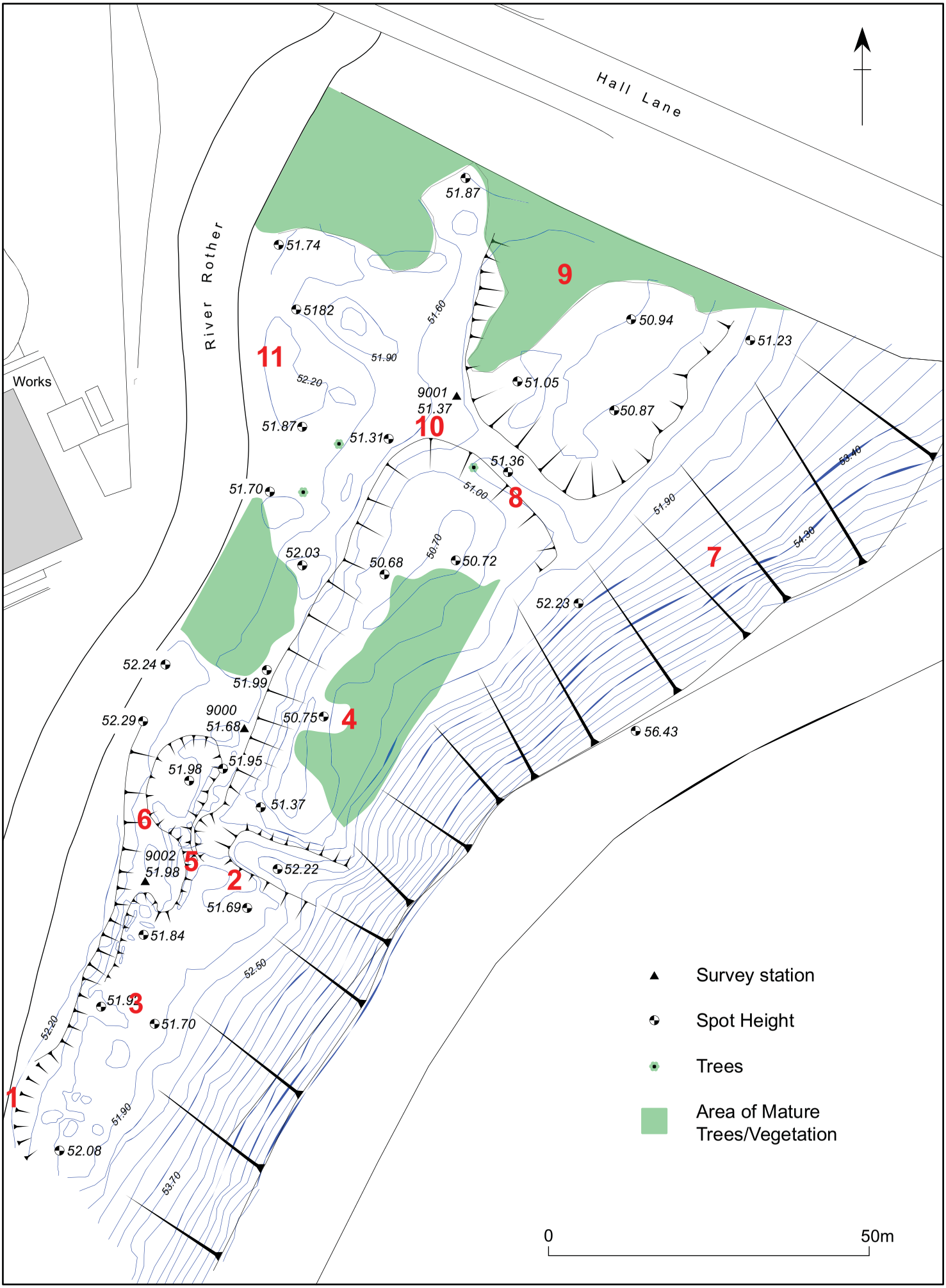


Fig.2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River Rother
Works
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51.74
5182
51.60
51.90
52.20
51.87
51.31
9001
51.37
10
51.36
51.00
51.70
8
52.03
50.68
50.70
50.72
9
50.94
51.23
51.05
50.87
11
51.90
53.40
54.30
7
52.23
52.24
51.99
52.29
9000
51.68
50.75
4
56.43
51.98
51.95
51.37
6
9002
51.98
5
2
52.22
51.69
51.84
52.50
51.93
3
51.70
52.20
1
51.90
52.08
53.70
Survey station
Spot Height
Trees
Area of Mature Trees/Vegetation
0
50m

Fig.3

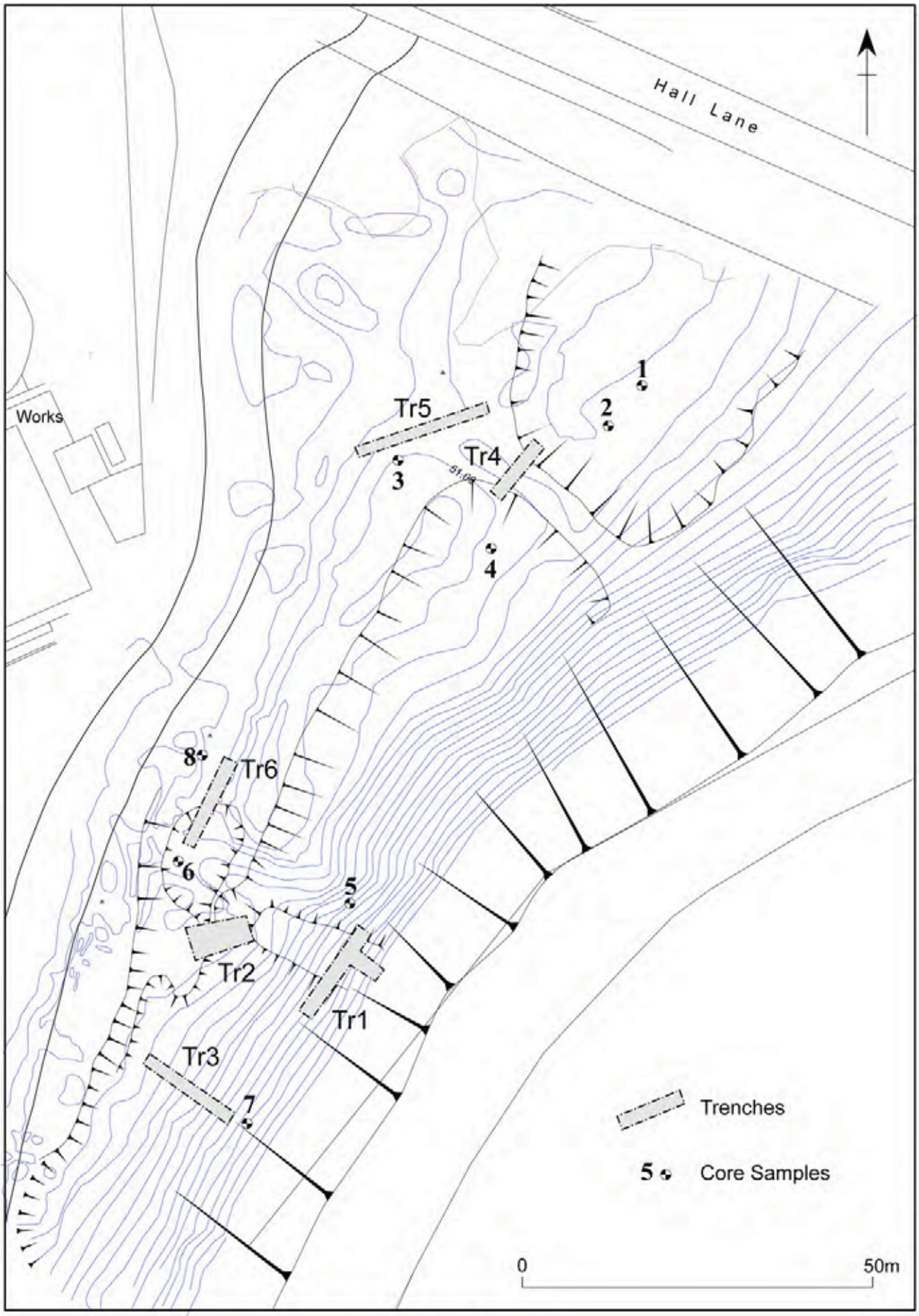

Hall Lane
Works
Tr5
Tr4
Tr6
Tr2
Tr1
Tr3
1
2
3
4
5
6
7
8
Trenches
5 Core Samples
0
50m

Fig.4

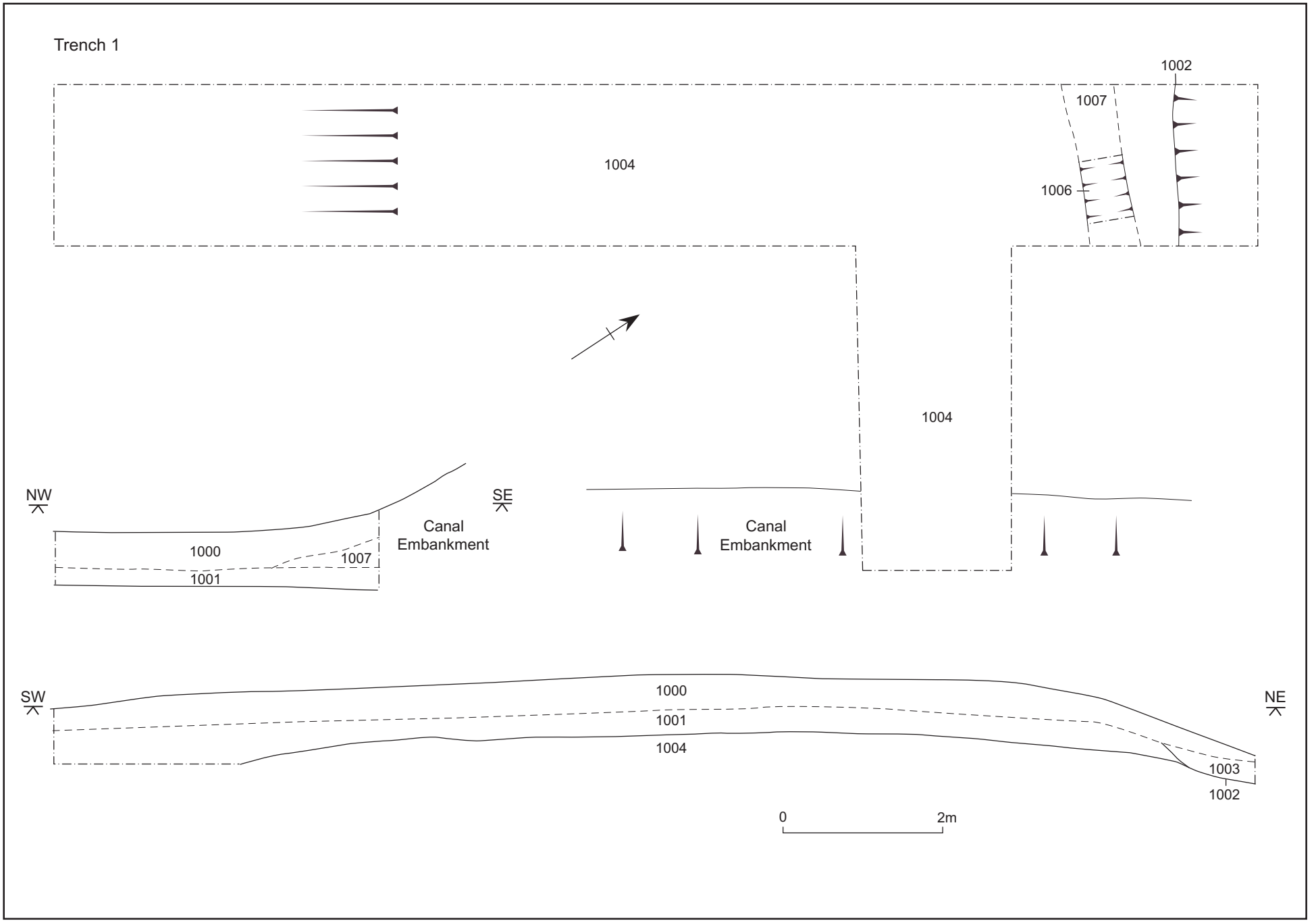

Trench 1
1002
1007
1004
1006
1004
NW
SE
Canal
Embankment
1000
1007
1001
Canal
Embankment
SW
1000
1001
1004
NE
1003
1002
0
2m

Fig.5

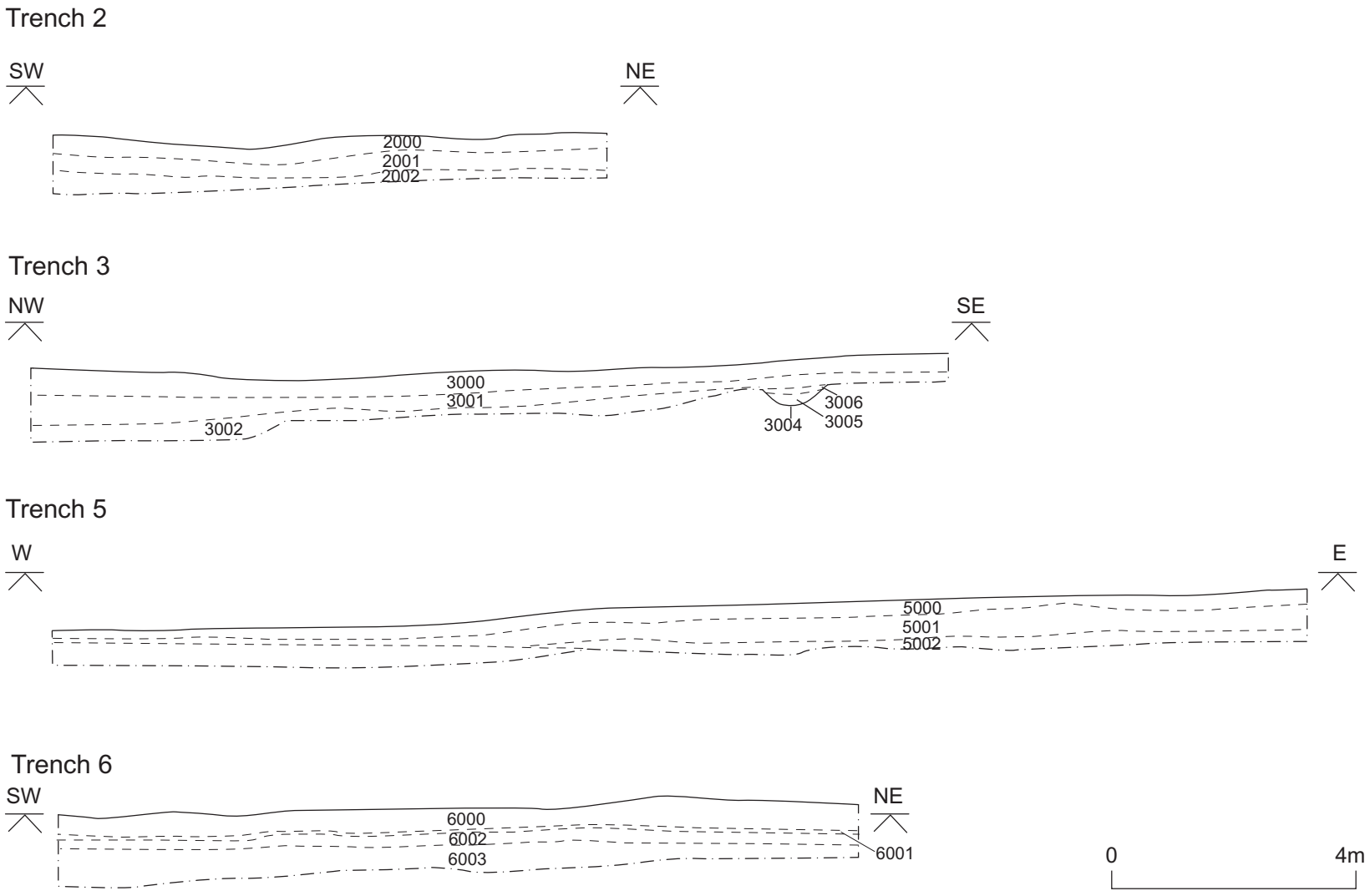

Trench 2
SW
NE
2000
2001
2002
Trench 3
NW
SE
3000
3001
3002
3004
3005
3006
Trench 5
W
E
5000
5001
5002
Trench 6
SW
NE
6000
6002
6003
6001
0
4m

Fig.6

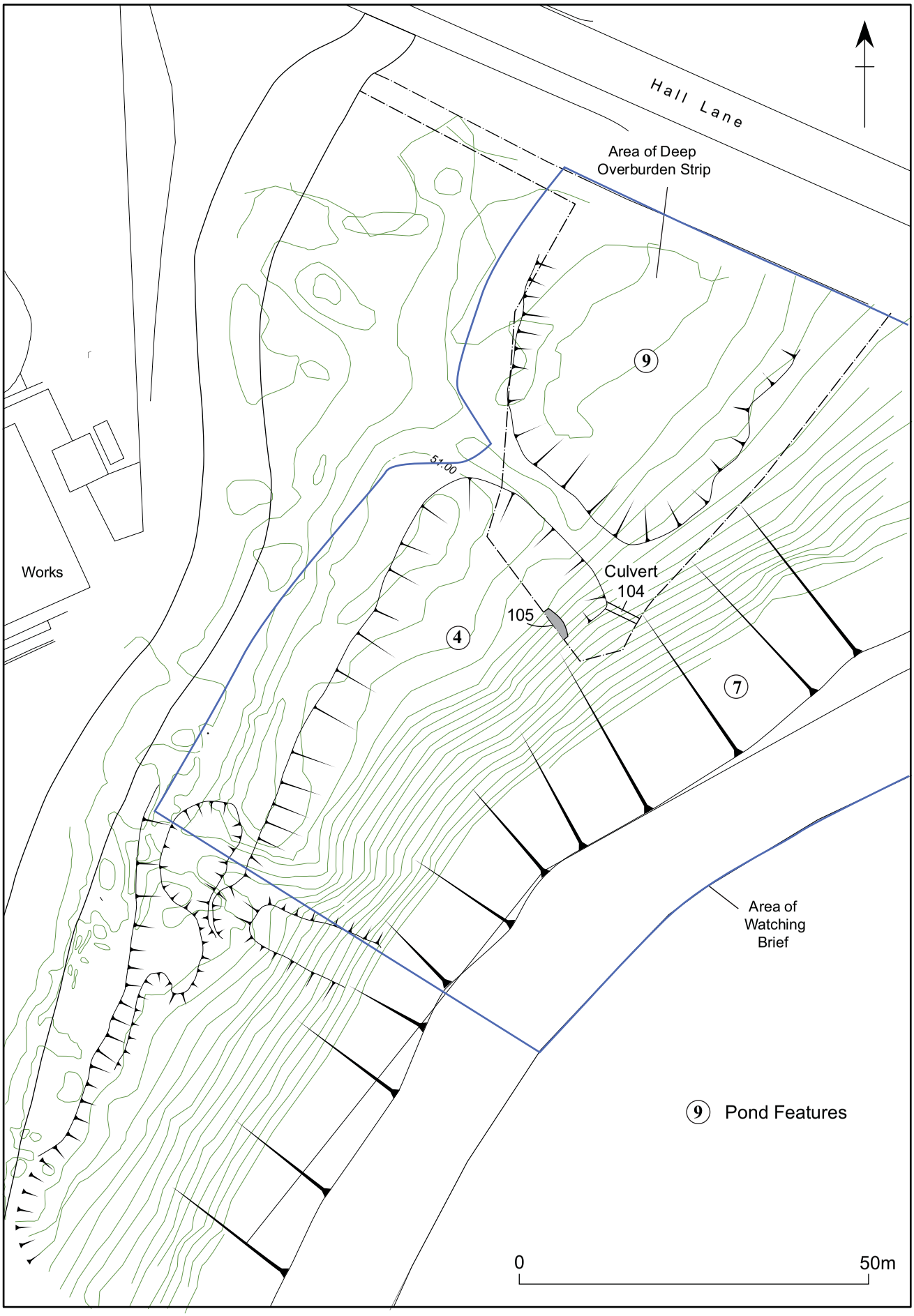
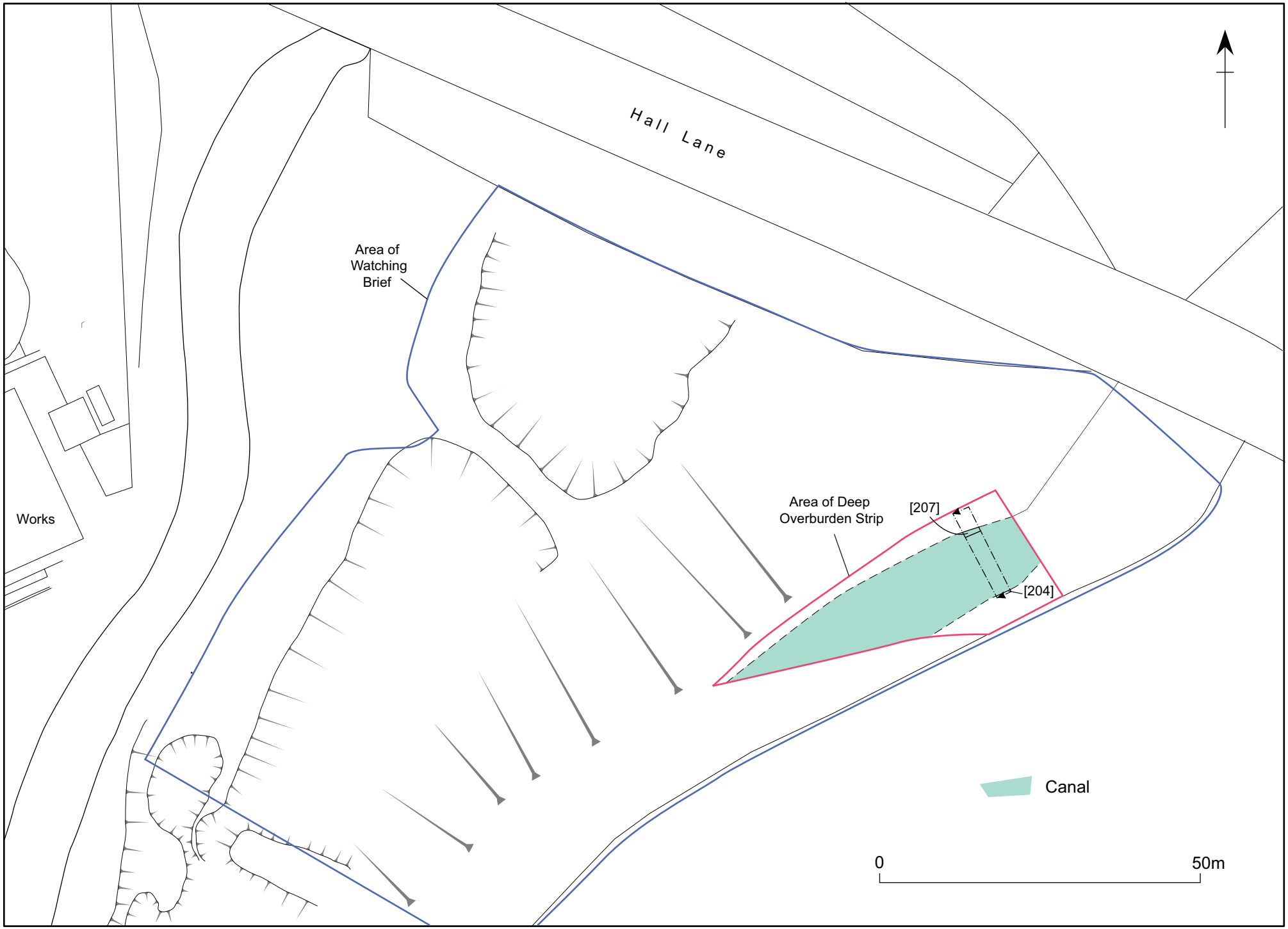

Hall Lane
Area of Deep
Overburden Strip
9
51.00
Works
Culvert
104
105
4
7
Area of
Watching
Brief
9 Pond Features
0
50m

Fig.7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Area of
Watching
Brief
Works
Area of Deep
Overburden Strip
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Canal
0
50m

Fig.8

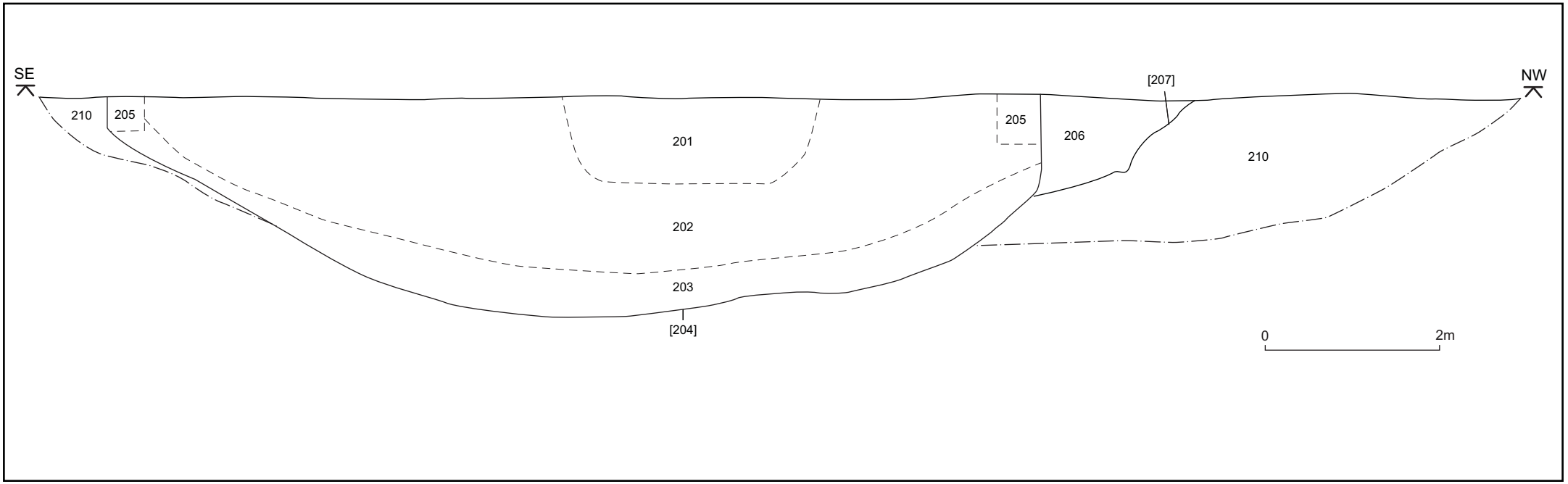

Fig.9

Plate 1

Plate 2

Plate 3

Plate 4

Plate 5

Plate 6

Plate 7

Plate 8

Plate 9

Plate 10