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A40 CARMARTHEN EASTERN BYPASS

STAGE 3 ARCHAEOLOGICAL EVALUATION OF THE PREFERRED ROUTE

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1 INTRODUCTION

It is the Secretary of State for Wales' intention to construct a bypass to the east of Carmarthen running for 4.5km from a point east of Abergwili passing largely along the line of an old railway line SE of Carmarthen to the Pensarn roundabout.

A detailed Stage 2: Archaeological Desk-Top Assessment and Walk-over Survey of the route has been undertaken by Dyfed Archaeological Trust in line with the Design Manual for Roads and Bridges Vol 11, Section 3, Part 2. A report on the Stage 2 assessment was submitted in October 1994.

In the light of the Stage 2 report and subsequent discussions on site, it was concluded that further work was required to investigate the category E sites, those whose potential or survival could not be accurately determined without field evaluation. A brief for commissioning a Stage 3: Archaeological Field Evaluation of the Preferred Route was prepared by Cadw: Welsh Historic Monuments on behalf of the Welsh Office Highways Directorate and forwarded to Dyfed Archaeological Trust by Howard Humphreys & Partners Limited in June 1995 with a request for a quotation. Dyfed Archaeological Trust submitted a quotation and a request to change the timetabling of the Stage 3 work. The quotation was accepted by Welsh Office in July 1995 and an new brief amended to account for a new timetable was forwarded to Dyfed Archaeological Trust.

The evaluation is broken down into four main areas: map research, geophysical survey, trial trenching and palaeoenvironmental sampling. The fieldwork was carried out in September and October 1995.

The trial trenching work was undertaken by H Wilson, J Purdue and G Bere and was supervised by R Ramsey under the direction of the author. Stratascan carried out the geophysical survey. The palaeoenvironmental sampling and analysis analyses was carried out by M J C Walker, A E Caseldine and J H James, Palaeoenvironmental Research Centre, University of Wales, Lampeter). The radiocarbon determinations were undertaken by Beta Analytic Inc., Miami, USA.

I am grateful to British Rail Property Board for granting access to the old railway line for the trial trenching and to Mr Withers, Mr Davies, Green Meadow Farm, and Carmarthen and District NHS Trust for allowing access onto their land for hand-dug trial trenches. Thanks are also due to Mr Lloyd, Dol-Gwili Farm, and Mr Davies, Green Meadow Farm for permitting access for the geophysical survey.

2 SUMMARY OF RESULTS OF THE ARCHAEOLOGICAL FIELD EVALUATION

This section contains of short summary of the results of the archaeological field evaluation. A fuller account of the results is contained in Section 6.

2.1 Map Research

2.1.1 Parade Farm (PRN 31067).

The site of this farm lies 30m to the north-east of the preferred route of the bypass and so will not be affected.

2.1.2 Carmarthen Tinplate Works (PRN 82).

Three buildings immediately to the east of the old railway line lie on the preferred route. These have been further evaluated by trial trenching (see Sections 2.3.1 and 6.1.2)

2.1.3 Dol-Gwili Brickworks (PRN 23982).

The site of this brickworks lies 20 - 40m west of the preferred route and so will not be affected.

2.1.4 St. Peter's Brickworks (PRN 87).

The former buildings of this brickworks lie 60 - 100m west of the preferred route, though some will be affected by a flood defence bank. The former brickworks clay pits lie directly on the line of the preferred route.

2.2 Geophysical Survey (PRN 31068)

Areas totalling 2ha were subjected to geophysical survey between Dol-Gwili Farm and Green Meadow Farm. Detected anomalies were weak and the only features of archaeological interest were old boundaries and a few isolated pits.

2.3 Trial Trenching

2.3.1 Carmarthen Tinplate Works (PRN 82)

The excavation on this site demonstrated that the surviving remains of buildings were slight and that they overlay a deposit at least 1.5m thick of slag and other industrial debris. It is considered that the buildings located in the map research (Sections 2.1.2 and 6.1.2) and subjected to excavation were built to serve the railway rather than forming part of the tinplate works.

2.3.2 Disused Railway (PRN 31071) and Medieval Priory (PRN 44)

Trial trenches on the course of the former railway line demonstrated that any archaeological deposits associated with the priory or with former quays and likely to be affected by engineering works are buried beneath at least 1.5m of railway embankment. The line of the pre-railway river bank or edge of terrace of the flood plain was established as being approximately on the western boundary of the preferred route.

2.3.3 Mill Leat (PRN 24346)

It was not possible to obtain a section across the best surviving length of the leat. Nevertheless, the narrow hand-dug trench demonstrated that the leat was of simple design and one phase of construction, probably dating to the 19th century.

2.3.4 Bryn Eithin (PRN 31070)

After careful examination in the field, it was considered that this earthwork is more likely to be a natural rather than a man-made feature. Nevertheless, a small hand-dug trial trench was excavated. No evidence was discovered to suggest that the earthwork was anything other than a natural feature.

2.4 Palaeoenvironmental Analysis (PRN 31069)

Peats that underlie made ground on the Towy floodplain to the south of Carmarthen were sampled in two machine-dug trenches. The peats were found to contain a rich pollen and plant macrofossil record that reflects local and regional vegetational changes in the c. 9th to the c. 12th century A.D. It is difficult to establish, on the evidence so far available, the nature of mineral sediments which overlies and underlies the peat, nor of the processes that led to the onset and subsequent cessation of peat accumulation in the area. The deposits are, however, of considerable ecological interest, and could add significantly to our knowledge of landscape changes in this part of South Wales.

3 CATEGORISATION OF SITES

This section lists sites by category as defined in DMRB, Volume 11, Section 2, Part 2, 3/1:

Category A: sites of national importance - usually Scheduled Ancient Monuments, or monuments in the process of being scheduled:

Medieval Priory (PRN 44)

Category B: sites of regional or county importance

Palaeoenvironmental analysis (PRN 31069)

Category C: sites of district or local importance

Dol-Gwili Brickworks (PRN 23982)

St. Peter's Brickworks (PRN 87)

Mill Leat (24346)

Disused railway (PRN 31071)

Category D: sites which are so badly damaged that too little now remains to justify their inclusion in a higher grade

Parade Farm (PRN 31067)

Bryn Eithin (PRN 31070)

Carmarthen Tinplate Works (PRN 82)

4 IMPACT ASSESSMENT

None: sites that will not be affected by engineering works

Parade Farm (PRN 31067)

Dol-Gwili Brickworks (PRN 23982)

Low: sites that will suffer only minor damage or small parts of extensive sites that will be destroyed

St. Peter's Brickworks (PRN 23982)

Mill Leat (PRN 24346)

Bryn Eithin (PRN 31070)

Disused railway (PRN 31071) and Medieval Priory (PRN 44)

Medium: sites that will be partly destroyed

Carmarthen Tinplate Works (PRN 82)

Palaeoenvironmental Analysis (PRN 31069)

High: sites that will be totally destroyed

No sites in this category

6 RESULTS OF THE ARCHAEOLOGICAL FIELD EVALUATION

6.1 Map Research

6.1.1 Parade Farm (PRN 31067) Figures 2, 3

The Ordnance Survey 1st Edition 1:2500 map shows this farm on a steep slope below The Parade and above the railway line. The out-buildings associated with this farm to the south-east of the railway were not in existence at the time of the survey of the O.S. 1st Edition map. A site inspection showed that no trace of the farm survives. The site of the farm will not be affected by engineering works, though the later, extant out-buildings will be demolished.

6.1.2 Carmarthen Tinplate Works (PRN 82) Figures 4, 5

Map research showed that three buildings lay to the south-east of the former railway line, near to the former tinplate works and in the direct line of the preferred bypass route. The remains of these buildings were planned and examined by trial trenching (Sections 2.3.1 and 6.3.1).

6.1.3 Dol-Gwili Brickworks (PRN 23982) Figures 6, 7

Dol-Gwili Brickworks, consisting primarily of a substantial range of buildings and a circular structure, probably a kiln, is shown on the 1:2500 O.S 1st Edition. This former brickworks lies 20 - 40m west of the preferred route.

6.1.4 St. Peter's Brickworks (PRN 87) Figures 8, 9

St. Peter's Brickworks, a timber yard, saw mill and other small industrial buildings lay to the south-east of the former railway line on the north bank of the River Towy. The line of the preferred route runs across the site of the backfilled brickwork's clay pit, and a flood defence bank will be built on the site of former buildings, including a kiln.

6.2 Geophysical Survey (PRN 31068) Figures 10, 11, 12, 13, 14 survey by Stratascan, Geophysical and Specialist Survey Services

The brief specified that magnetometer survey should be undertaken on the presumed site of Dol-Gwili Brickworks and on a river terrace to the south in which a roundabout will be constructed. A provision for 2ha of magnetometer survey was requested with the location of the survey grids selected by the archaeological contractor on the basis of map research and the lie of the land.

The map research demonstrated that the site of Dol-Gwili Brickworks (23982) did not lie on the line of the preferred route. Nevertheless, the fields between Dol-Gwili Farm and Green Meadow Farm represent the only substantial corridor of undeveloped land on the preferred route and it was therefore decided to concentrate the 2ha of magnetometer survey in this area. The survey was carried out by Stratascan on 20-22 September 1995. Since

completing the survey it has been noted that an administrative boundary, probably following the course of a former meander of the River Gwili (see Fig. 6), curves across the survey area of Site 2 (see below). It is likely that some of the magnetic anomalies noted in this area are a result of this river activity. Also, according to oral testimony, several concrete slabs for huts were built in vicinity of the survey area during the Second World War, though their exact location could not be recalled.

The results are shown here in graphic form (Figs. 11-14), based upon the figures in Stratascan's report. Magnetic features have been identified and plotted onto Figures 12, 14, numbered for ease of reference and prefixed with the letter 'M'. The following descriptions are from Stratascan's report:

Site 1.

Discussion: there are areas of general noise on this site. M1/1 is thought to be modern agricultural lines. M1/2 is a pair of linear features which are stronger in nature. There are several small anomalies such as M1/3, M1/5, M1/6 and M1/7 which may be pits.

Conclusion: very few features showing archaeological potential are to be seen in this section of the survey. The dominant features are the parallel rectilinear anomalies running diagonally across the site which are most probably modern agricultural lines. The whole area is also rather noisy. However, several stronger positive anomalies can be seen which may be pits filled with a magnetic fill.

Site 2.

Discussion: there are areas of 'noise' in this site (M2/3 and M2/4) which are thought to be the result of brick debris. The southern-most area has a pair of weak rectilinear features (M2/5), but no other anomalies thought to be significant. In the middle section, M2/6 is a rectilinear anomaly which leads into the noisy area M2/3, and is thought to be as a result of brick rubble or slag. M2/7 is a double parallel rectilinear anomaly within this area. The northern section is dominated by the effects of the two metal pipelines crossing the site M2/1 and M2/2, and M2/4 is an area of noise. There are several weak linear anomalies (M2/9, M2/10, M2/11 and M2/12). M2/8 is thought to be the only anomaly which may be of archaeological interest.

Conclusion: the southern-most area in this section shows no anomalies of any significance. The middle area has a rectilinear anomaly diagonally crossing the site which at its north-eastern end becomes more wide spread and noisy in character. The strength of these anomalies suggests that they are made up of thermoremanent material such as brick rubble or slag. Of more interest is a rectilinear anomaly M2/8 which may be a bank and ditch. This may be the line of an old field boundary or possibly part of an enclosure of archaeological interest.

6.3 Trial Trenching

6.3.1 Carmarthen Tinplate Works (PRN 82) Figures 15, 16

The brief noted that a complex of building foundations survives on the south-east side of the former railway line alongside the remains of the Carmarthen Tinplate Works, and requested that the scrub should be cleared from these foundations and a plan made which could be compared with the layout of the buildings revealed by the map research. Following this work, the brief requested the hand-digging and recording of a series of trenches of a total area of 50 sq m to investigate these remains.

Following the excavation of Trenches 1 and 2, it was considered that the revealed archaeological remains did not warrant the hand-digging of further trenches up to a total of 50 sq m. Mr R. C. Turner, Cadw, agreed that the evidence exposed in Trenches 1 and 2 was sufficient to evaluate the archaeological potential of the site. However, in addition the hand-dug trenches, a machine-dug trench, Trench 3, was excavated down to 1.5m.

The general configuration of the buildings on the 1st Edition 1:2500 Ordnance Survey map (Fig. 4) and the earthworks revealed by scrub clearance (Fig. 15) are similar, though not an exact match; clearly, there has been alterations to the buildings between the surveying of the O.S. 1st Edition and the closure of the railway line.

Oral testimony attests to the use of the buildings, at least in their last period of occupation, for railway use. A pumping station, powered by a static steam engine, stood on the bank of the River Towy. This is the lowest point on the river at which fresh water can be guaranteed at high tide. The installation pumped water to cattle pens and to the railway sheds which were situated downstream. Some of the cast iron pipes discovered in the trench digging on the railway (see below) were undoubtedly from the pumping station, and a pipe can still be seen leading from the pumping station into the river. The 1st Edition O.S. map shows a building on the site of the pumping station, possibly indicating that this installation was in existence by 1887. When the railway was abandoned other buildings on the site consisted of a workmen's hut and storage areas. Following closure of the railway, the site was used as a vegetable plot.

Trench 1 was dug across the most prominent earthwork - the presumed site of a building. The deposits encountered in this trench were all modern (Fig. 16); subsoil was not reached despite the fact that the deepest element of the trench was c. 2.8m below the surface of the former railway. The only structural element was a stone wall (24); this was founded on a deposit of clinker and other furnace residue (23). No floor surfaces were discovered. All other deposits contained residues from the Tinplate Works, and it can be conjectured from Figure 16 that the railway embankment is constructed from similar material.

Trench 2 was dug against the north-east side of a wall. The upper courses of the wall were of brick, the lower of stone. The trench was excavated down to 1.5m below the present ground surface,

though the bottom of the wall was only 1m down. Deposits of clinker, slag and other industrial residue comprised the majority of the deposits. As with Trench 1, subsoil was not reached.

Machine-dug Trench 3 was excavated across the lowest part of site in an attempt to locate subsoil beneath the modern deposits; this objective was constrained by a maximum trench depth of 1.5m. Estuarine muds and silts were noted in the bottom of the trench at its south-east end where the overlying modern deposits thinned out towards the river bank, but elsewhere only layers of clinker, slag and other industrial debris similar to that in Trenches 1 and 2 were encountered.

Evidence from the excavation demonstrated that the building remains and other features examined here post-date the deposition of industrial debris from the Tinplate Works. It seems likely, therefore, that the buildings recorded on the 1st Edition O.S. map were built to serve the railway and were not associated with the Tinplate Works; this is confirmed by recent oral testimony. The excavation also demonstrated that any pre-railway archaeological deposits are buried beneath at least 1.5m and probably greater than 2.8m of modern debris.

6.3.2 Disused Railway (PRN 31071) and Medieval Priory (PRN 44) Figures 17, 18, 19, 20

The brief requested that along the line of the disused railway and within the area to be affected by engineering works, a series of mechanically excavated, hand-cleared and recorded trial trenches should be dug and backfilled. Trenches should be at a safe working width and be dug to 1.5m deep maximum or to the first surviving archaeological layers below railway make-up. Within or adjacent to this area are the remains of the medieval priory (PRN 44) and its mills later converted into the Tinplate Works (PRN 82). There is also potential to find riverside quays at this location. A provision for 120m of trial trench was made, including two short connections to the river bank.

The arrangement and location of the 120m of trial trench was agreed on site with Mr R. C. Turner, Cadw. Part of one trench lay slightly outside the area to be affected by the engineering work (Fig. 17), but it was considered necessary to locate them in such a position in an attempt to ascertain the pre-railway topography of the site. The short connections to the river bank requested in the brief were constrained by the presence of property fences and a sewer in a key position. Trenches TR1 and TR 5 however ran close to the edge of the railway embankment, and these, coupled with the machine-dug trench, Trench 3, on the Tinplate Works (see above) provide sufficient evidence to evaluate the archaeology on the riverside edge of the railway.

The most useful information was gained from the discontinuous section across the railway line formed by the trenches TR4, TR3 and TR5 (Fig. 18). These are therefore described first:

TR4 was excavated with its north-west end hard against the base of the railway cutting. As expected, the railway cutting had been

terraced into the valley side at this point. Natural geological deposits (context 10) comprising yellowish-grey silty-clay with a high proportion of gravel were encountered c. 0.6 - 1.0m below the ground surface. The relatively flat surface resulting from this terracing had been employed as a base on which to construct a series of buildings (engine sheds and other structures associated with the railway), the foundations of which were detected in the trench. The residues from this terracing undoubtedly were used in the construction of the railway embankment. It seems likely that layers 7, 8 and 9 in TR4, layer 13 in TR3 and layers 28 and 29 in TR5 were these residues.

TR3 contained the remains of a substantial stone wall at its north-east end. This wall was associated with the railway. It was butted by a substantial layer of redeposited subsoil (13). Beneath this layer, at the base of the trench a layer of silty-clay containing mortar fragments and sherds of 19th century pottery may represent the pre-railway ground surface, though this could not conclusively demonstrated.

All the deposits revealed in TR5 were associated with the construction of the railway embankment. The very steep angle of rest of the layers shown on the section drawing seems to suggest that the thickness of the embankment in this trench is considerably deeper than 1.5m.

Trenches TR2 and TR6, excavated along the course of the former railway line, revealed little additional information to that discovered in the trenches described above. Of some interest towards the western end of TR2 was a c. 1m thick deposit of what appears to beach sand (11) incorporated into the make-up of the railway embankment. Beneath this deposit at the very base of the trench a layer of clay (6) seemed to be the pre-railway ground surface, but this was not confirmed. A substantial, extant timber upright in TR2 seemed to have been placed in position at the time of railway construction.

In TR1 substantial timber shoring, which still survives, had been incorporated into the make-up of the railway embankment. All deposits revealed were associated with railway construction.

The excavation on the former railway line revealed that any archaeological deposits associated with the medieval priory and with possible quays, and likely to be affected by the engineering works for the bypass lie at a depth greater than 1.5m below current ground surface. It was also demonstrated that the pre-railway river bank or edge of terrace onto the flood plain of the River Towy lay approximately between the south-east end of TR4 and the north-west end of TR3.

6.3.3 Mill Leat (PRN 24346) Figures 21, 22

The brief noted that a c. 20m length of the mill leat to the medieval mills of Carmarthen Priory and the later Tinplate Works will be destroyed by the engineering works. It was therefore requested that a single hand-dug section across the leat should

be excavated and recorded.

Because of the proximity of the proposed excavation to Glangwili Hospital, a site meeting was arranged between Mr N Ludlow (Dyfed Archaeological Trust), Mr O G Thomas (Howard Humphreys) and Mr G Rees (Carmarthen and District NHS Trust) to decide on a location for the trench which would minimise noise disturbance to hospital patients. The actual trench was dug a few metres to the north of that decided at the meeting because of severe root disturbance at the original designated site.

The hand-dug section is not truly representative of the leat as a whole as at the designated site, and for the majority of the length of the leat scheduled to be destroyed, a former bank on its south-east side has been removed to allow access for farm machinery through the narrow corridor between the railway cutting and the leat. A short length of this bank will be destroyed to the south-west of the excavation trench.

The section demonstrated that the leat was a simple construction; no lining or other structural elements were discovered and there was no evidence to suggest that the leat was anything other than a post-medieval construction, built to serve the Tinsplate Works.

The leat was c. 4m wide and 2m deep and had been dug into ground which sloped down gently from north-west to south-east. Waste from the digging of the leat had been formed into a bank on the south-east (removed on the line of the section). The geology of the site consists of banded, fluvio-glacial gravels, and the leat had simply been cut into these; no lining of clay or other material was discovered. After a period of silting, represented by contexts 6 and 7, it would seem that a layer of cobbles set in clay was deliberately laid down. This was a fairly recent event, as a sherd of 19th century pottery incorporated in the layer provides a *terminus post quem*. Silt and rubbish then began to accumulate in the leat (context 3), a process that is still continuing.

6.3.4 Bryn Eithin (PRN 31070) Figure 23

The brief requested mechanical excavation amplified by hand-clearing and recording of a trench to the south of Bryn Eithin earthwork.

The earthwork comprises a low linear bank which runs diagonally north-east to south-west across a field to the north of the former railway line near Abergwili. There are no diagnostic features to the bank to indicate its former function or age; it is probably a natural feature. The bank terminates on the north side of a boundary fence to the former railway.

A small trench was excavated to the south of this fence in scrubby woodland on a narrow strip of land alongside a railway cutting. Because of the woodland it was not possible to machine-excavate the trench. The trench measured 2.5m x 1m by 1m deep. Below leaf litter lay a 0.3m thick orange brown silty-loam soil.

This in turn overlay 0.5-0.6m of greyish brown hill-wash which overlay subsoil. No artefacts were discovered during the excavation of the trench.

6.4 Palaeoenvironmental Analysis (PRN 31069) Figures 24, 25, 26. by M.J.C. Walker, A.E. Caseldine and J.H. James (Palaeoenvironmental Research Centre, University of Wales, Lampeter)

The brief noted that an area of peat had been located south of the river Towy during geotechnical survey and identified in the desk-top assessment as potentially significant in reconstructing the environmental history of the lower Towy basin.

The brief requested the selection of a sampling location within the area of chainage 500 (NGR SN 4150 1950) and the collection of two complete cores through the peat. One of these is to be stored for future reference and potentially full analysis. The stratigraphy and plant macrofossils of the second core to be described in detail. Pollen samples at 10cm intervals are to be analysed to assess the need for full analysis. Radiocarbon dates are to be obtained for the top and bottom of this sediment. The brief also requested in the light of this sampling exercise, the advisability of undertaking a full analysis of this peat sequence and make any recommendations for future work.

6.4.1 Fieldwork

In September 1995, two machine-cut trenches were excavated to depths of c. 2.8m (Fig. 24, Sites 1 and 2). In each trench, brown fibrous peats intercalated between grey silts/clays, were exposed beneath 1-2m of made ground. Samples were taken from the exposed section faces in standard monolith tins, each 15 x 15cm in cross section, and 30, 40 or 50cm in length. The sampling column spanned the entire thickness of peat/organic mud and extended into both the overlying and underlying silts/clays. The monoliths were wrapped in clingfilm and transported to the laboratory where they have been stored in a deep-freeze.

The lithostratigraphic sequence exposed in the two trenches was as follows:

Site 1. (top of monolith sequence 1.85m below ground surface)	
0-6cm	Grey silt/clay with small stones
6-10cm	Inclined band of grey grit
10-13cm	fine grey silt/clay: paste-like and structureless with a small amount of organic matter
13-47cm	Fine grey-brown mud, organic content gradually increasing with depth. Lower boundary sharp.
47-73cm	Light brown sedge(?) peat. Very fine in texture and relatively dry

- 73-88cm Gradual change to more organic mud; organic content decreases progressively towards the base of the unit
- 88-92cm Grey silt/clay. Fine paste-like and structureless. Some organic content, but relatively little
- Site 2 (top of monolith sequence 1.05m below ground surface)
- 0-7/18cm Grey-brown mud, paste-like in texture, becoming gradually more organic with depth. lower boundary diffuse over c. 10cm
- 7/18-28cm Brown organic mud
- 28-48cm More fibrous organic mud/peat, with fine layers of drier past-like mud/peat
- 48-75cm Light brown sedge (?) peat. Very fine in texture and relatively dry
- 75-95cm Woody peat, coarser in texture and more fibrous
- 95-109cm Brown organic mud/peat; much finer and with fewer macrofossils
- 109-147cm Intercalated brown organic mud and grey silt/clay. Macrofossils of wood near the base. Increasingly paste-like; clay content increasing downwards
- 147-151cm Grey silt/clay with some organic mud. Macrofossils of reeds and small wood fragments

6.4.2 Laboratory methods

Samples for pollen analysis were prepared using standard techniques including digestion in 10% KOH followed by acetolysis (Moore et al., 1991). Residues were mounted in safranin-stained glycerine jelly and analysed using a Vickers M15C microscope at x400 magnification, with critical identifications under oil at x1000. Pollen and spores were categorised on the basis of the key in Moore et al. (1991). As this was essentially a reconnaissance exercise, a sum of only 100 land pollen grains was adopted. Nine levels were counted from Site 1 and 15 from Site 2. All contained pollen, with peats in particular yielding relatively large numbers of well-preserved grains.

As a rapid means of assessing the plant macrofossil potential of the deposits, the residues retained in the 106 micron sieves during the pollen preparation process were examined. The plant remains recorded are presented in Tables 1 and 2. Other remains were also noted. However, as these samples were very small (c. 1ml) and therefore larger seeds are likely to be under-represented, a further nine samples, 10ml in size, were selected on the basis of the stratigraphic and pollen evidence for examination.

The sieve mesh size for these samples was 250 microns. These samples are not reported in detail but reference will be made to them where they provide additional information. The 10ml samples examined from Site 1 were from 25-30cm, 50-55cm and 75-80cm, and from Site 2 from 20-25cm, 40-45cm, 60-65cm, 100-105c and 120-125cm. Identifications were based on comparison with modern reference material and standard identification texts. Nomenclature follows Stance (1991).

6.4.3 Radiocarbon dating

As Site 2 contained the longer record, both radiocarbon samples were taken from this profile. Sample 1 (CEB-14) was taken at 14cm which lies at the base of the transitional unit from overlying silts/clays to underlying organic mud. The sampling point was at that part of the profile where organic sediment became predominant. Sample 2 (CEB-109) was taken from the lowestmost organic sediments in the profile.

The radiocarbon dating was undertaken by Beta Analytic Inc., Miami, Florida. The results are as follows:

Sample 1 (CEB-14) Beta-86592: 1000 ± 50 BP (radiocarbon years before present).

Calibrated result (2 sigma, 95% probability): cal AD 975 to 1170

Sample 2 (CEB-109) Beta-86593: 1060 ± 50 BP

Calibrated result (2 sigma, 95% probability): cal AD 885 to 1035

6.4.4 The pollen record

Pollen diagrams for the two profiles are shown in Figures 25 and 26. The records are very similar, and can be divided into three local pollen assemblage zones (PAZ):

CEB-1: A biozone dominated by woody plant pollen, particularly *Alnus* (alder), but also *Quercus* (oak), *Corylus* (hazel) and, to a lesser extent, *Fraxinus* (ash). This biozone is more strongly represented at Site 2, where the upper levels are also characterised by a significant increase in *Apiaceae*.

CEB-2: A biozone dominated by *Poaceae* and *Cyperaceae*, during which there is marked reduction in pollen of woody plants. *Pteropsida* counts also increase in this biozone.

CEB-3: A biozone dominated by *Poaceae*, with relatively high counts for *Asteraceae*, *Lactuceae* and *Rumex*, with important contributions from *Caryophyllaceae*, *Plantago* spp (plantain) and *Ranunculus* (buttercup). This zone is more strongly represented at Site 1, where there is also a clear increase in woody plants, initially *Quercus* (oak) and *Corylus* (hazel), but subsequently also *Alnus* (alder).

6.4.5 The plant macrofossil record

Site 1: The lowest two samples (Table 1, 90cm and 80cm) contained little macroscopic vegetative material but large quantities of *Juncus* (rush) seeds. *Mentha* (mint) and Poaceae seeds were also recorded. In 75-80cm monocotyledonous (monocot.) remains dominated and *Alisma* and *Ranunculus* were present. Monocot. remains were much more frequent in samples 70cm, 60cm and 50cm. *Juncus* seeds were much less abundant and *Carex* (sedge) and *Lychnis flos-cuculi* (ragged robin) seeds present. In 50-55cm monocot. remains were abundant and occasional fragments of wood occurred. Larger seeds, notably *Carex*, were frequent. Other seeds included *Lychnis flos-cuculi* and other Caryophyllaceae. In the remaining samples (40cm, 30cm and 20cm) *Juncus* became more frequent again and *Montia fontana*, *Ranunculus*, Poaceae and *Sagina* (pearlwort) type occurred. These were also present in 25-30cm as well as Apiaceae. Apart from *Juncus*, Poaceae and *Carex* seeds were recorded at 10cm.

Site 2: The lower samples (Table 2, 140-80cm) contained cone-scales and fruits of *Alnus*. Fragments of wood and leaves dominated the samples. *Urtica dioica* (stinging nettle), Brassicaceae, *Rumex* and *Rubus* were present and fern sporangia were frequent. In contrast the upper samples (70-10cm) were dominated by monocot. remains. The final sample (0cm) was dominated by minerogenic material. *Stellaria/Cerastium* type seeds occurred in a number of samples and Apiaceae, *Persicaria*, *Urtica dioica* and *Ranunculus* were present occasionally. A similar range of material was recorded in the 10ml samples but the larger seeds were better represented. For example, *Carex* seeds were particularly frequent in 20-25cm and *Ranunculus* and *Rubus* were also present. In addition, *Rubus* and *Alnus*, not recorded at 60cm in the sample from the pollen sievings, were recorded in the 60-65cm sample.

6.4.6 Discussion

The palaeobotanical data from the two sites reflect an initial episode of woodland, in which *Alnus glutinosa* was the dominant element, with *Quercus* and *Fraxinus* on drier sites around on the valley floor and also, perhaps, on the surrounding hillslopes. The very high counts for *Alnus* pollen, especially at Site 2, suggest that an alder carr was well established on the river floodplain, and this is confirmed by the plant macrofossil evidence. The progressive decline in *Alnus* throughout local PAZ CEB-1 and the abrupt rise in Cyperaceae pollen in CEB-2 appears to reflect the replacement of this alder carr by open sedge fen. Again the pollen evidence is supported by the plant macrofossil evidence which demonstrates the presence of sedges (*Carex*) locally. This may have been due to a gradual rise in the water-table for, particularly at Site 2, the rise in the curve for sedge pollen is preceded by an increase in taxa frequently associated with damper habitats, most noticeably species of Apiaceae (Umbelliferae) which are present in the plant macrofossil record, *Filipendula ulmaria* (meadowsweet) and perhaps also *Ranunculus* (*Caltha palustris* [kingcup]/*R. aquatilis*?) and *Galium* (*G. palustre* [marsh bedstraw]/*G. uliginosum* [fen bedstraw]?). The duration of this event cannot be established on present evidence. Subsequently, drier conditions seem to have obtained, with a slight increase in woody plant pollen and a limited re-establishment of alder carr (Site 1). The upper part of the record seems to be

dominated, however, by taxa associated with grassy or waste places. These include *Plantago lanceolata* (ribwort), *P. coronopus* (buck's horn plantain), *Rumex*, *Potentilla*, and species of *Poa*-*ceae*, *Caryophyllaceae*, *Asteraceae* and *Lactuceae*. Several (e.g. *P. lanceolata*) are often associated with agricultural activity (Behre, 1986), although they also occur as ruderals in natural habitats. An open grassland, with intermittent patches of bare ground, appears to be reflected in the record. An open environment is also indicated by the plant macrofossils. Further detailed plant macrofossil analysis may provide more precise information about the open habitats available.

What is not clear from the present evidence, is the nature of the underlying and overlying silty clays. One hypothesis might be that they are estuarine muds, and hence the transition from mineral sediment to peats in the lower parts of the profiles represents a relative fall in sea-level (a marine regression), while the upper levels of the profiles, the general change from organic to mineral sediment is indicative of a relative rise in sea-level (a marine transgression). The River Towy is currently tidal to this point in the valley, and therefore a marine influence at the site would not be unexpected. In the pollen records from the two sites described here, however, there are no obvious indicators of marine influence (*Chenopodiaceae*, for example), although it is possible that some of the species included in the *Asteraceae* and *Caryophyllaceae* categories could have maritime affinities. Similarly there are no clear indicators of a brackish-water environment in the plant macrofossil record. One way in which this problem might be addressed would be to employ diatom analysis, but this lies outside the scope of the current report. Other hypothesis regarding the silts and clays involve changes in fluvial régime (although the fine-grained and cohesive nature of the sediments suggest a low energy environment of deposition), or backswamp sedimentation of the Towy floodplain governed, perhaps, by local hydrological variations.

6.4.7 Bibliography

Behre K.-E. (ed) (1986): *Anthropogenic Indicators in Pollen Diagrams*. Balkema, Rotterdam.

Moore P.D., Webb J.A. & Collinson (1991): *Pollen Analysis*. 2nd edition. Blackwell, Oxford.

Stace C.A. (1991): *New Flora of the British Isles*. Cambridge University Press, Cambridge.

7 CATALOGUE OF RESEARCH ARCHIVE

The archive has been catalogued according to National Monument Record (NMR) categories and contains the following:

A.1 Final Report
A.2 Report - disc

B.1 Context Records

C.1 Catalogue of all drawings
C.2 Site drawings

D.1 Catalogue of photographs
D.2 Colour slides
D.3 Black and white negatives and contact prints

E.1 Catalogue of boxed finds

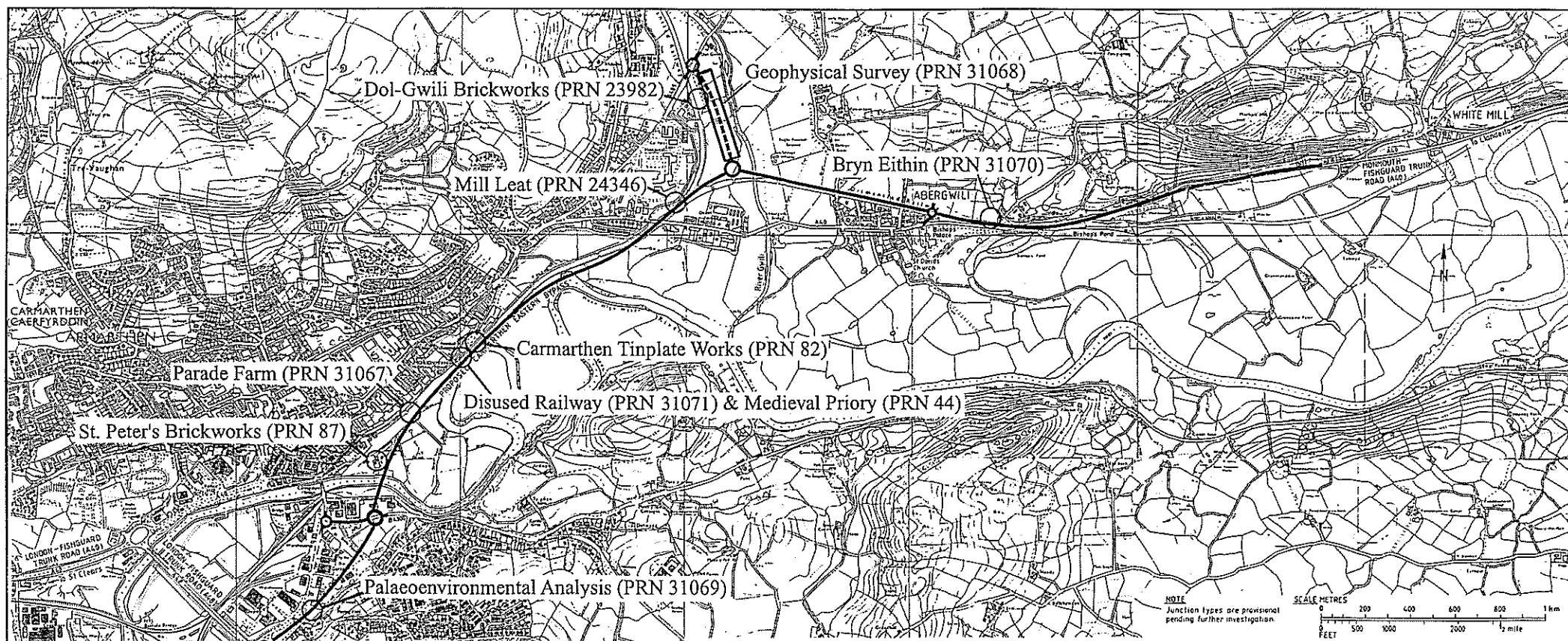
F.2 List of preserved samples
F.4 Unpublished analyses
F.5 C14 reports

I.5 Final report - typescript
I.6 Final report - disc

J.1 Final drawings

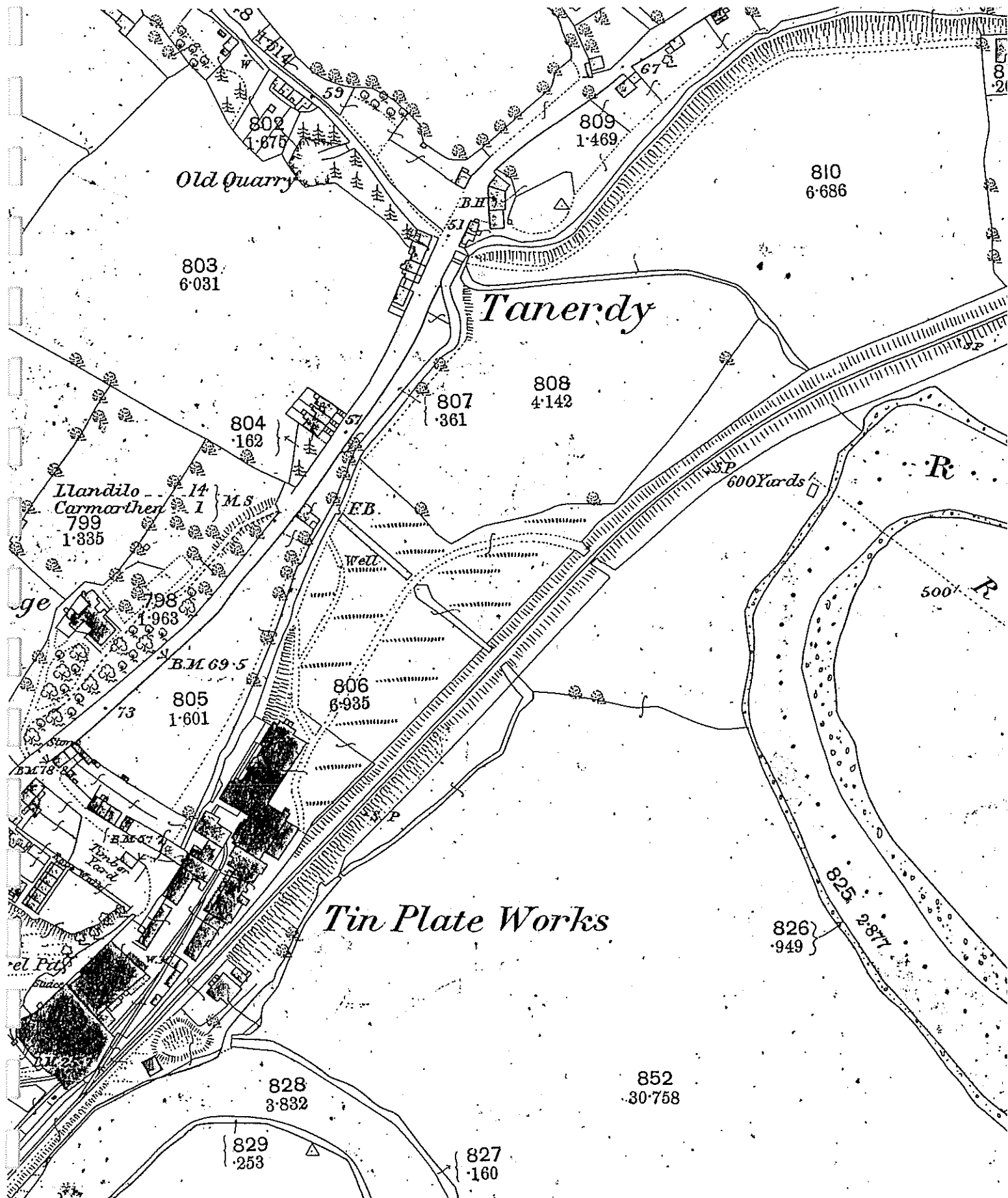
L.1 Project Brief
L.4 General administration

M.1 Correspondence



Location Map of Sites Evaluated



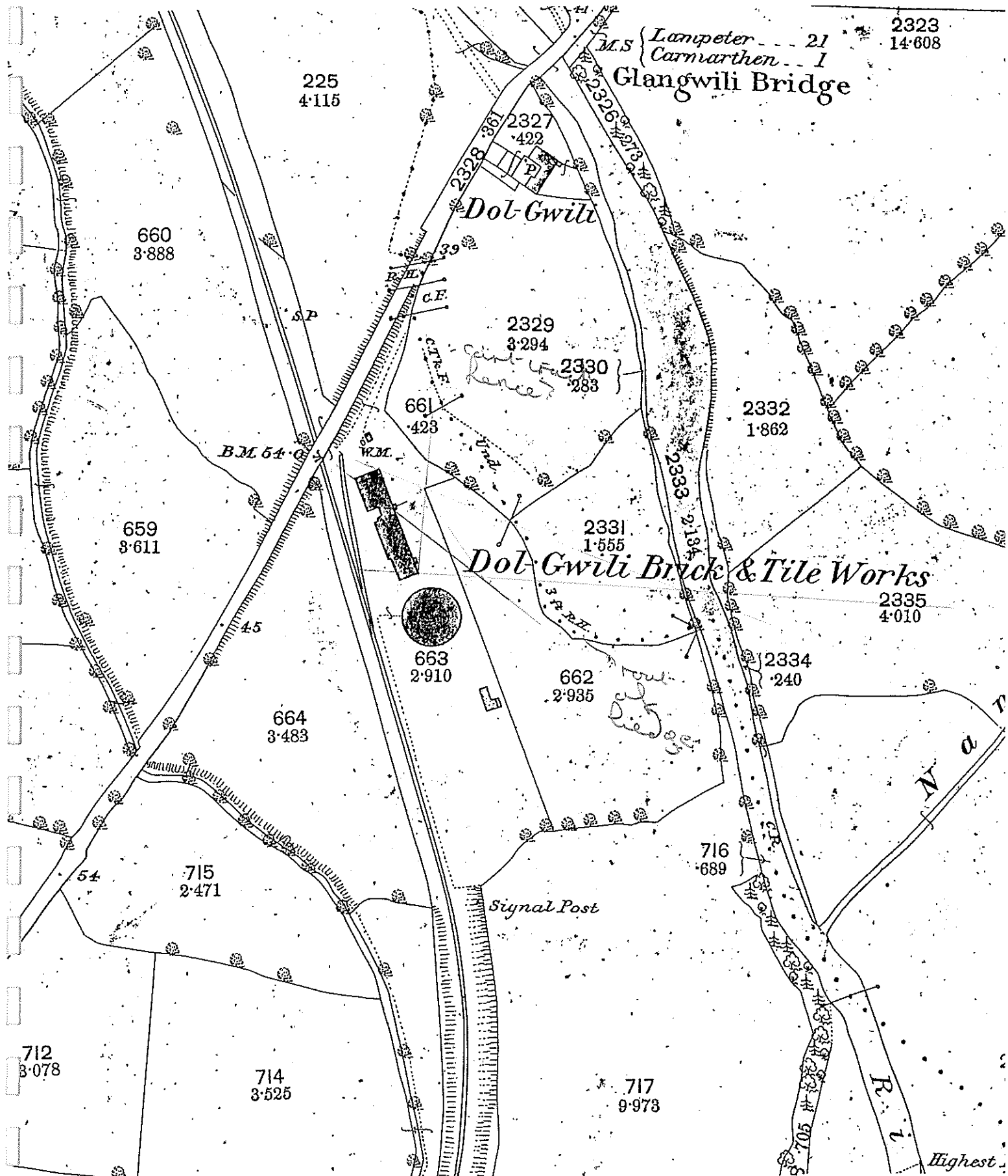


PRN 82 CARMARTHEN TINPLATE WORKS

EXTRACT OF THE OS 1:2500 1ST ED. CARMARTHEN XXXIX.3
(SURVEYED 1887)

SCALE 1:2500

Figure 4

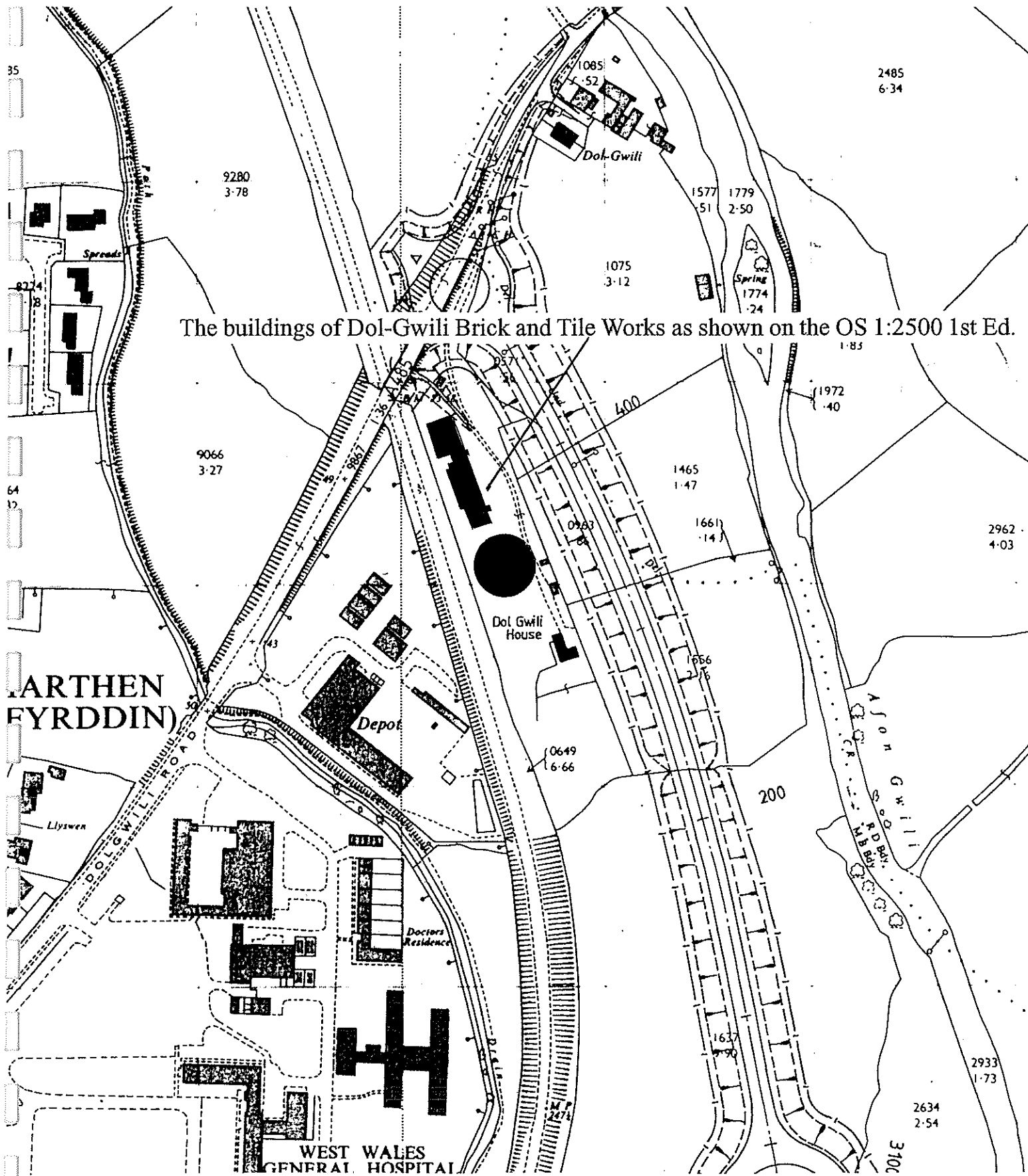


PRN 23982 DOL-GWILI BRICK AND TILE WORKS

EXTRACT OF THE OS 1:2500 1ST ED. CARMARTHEN XXXIX.3
(SURVEYED 1887)

SCALE 1:2500

Figure 6



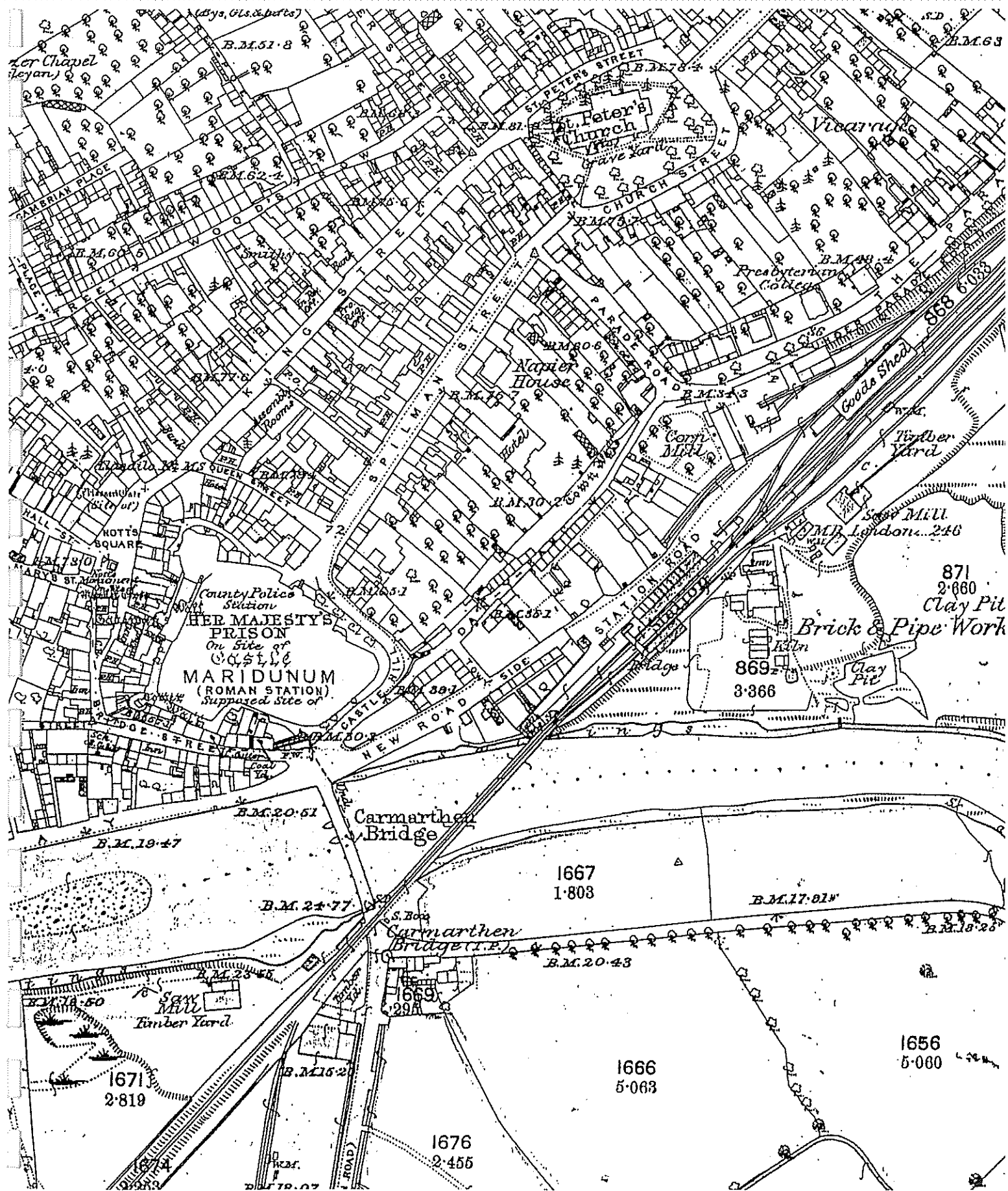
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 (SURVEYED 1887)

SCALE 1:2500

Figure 7

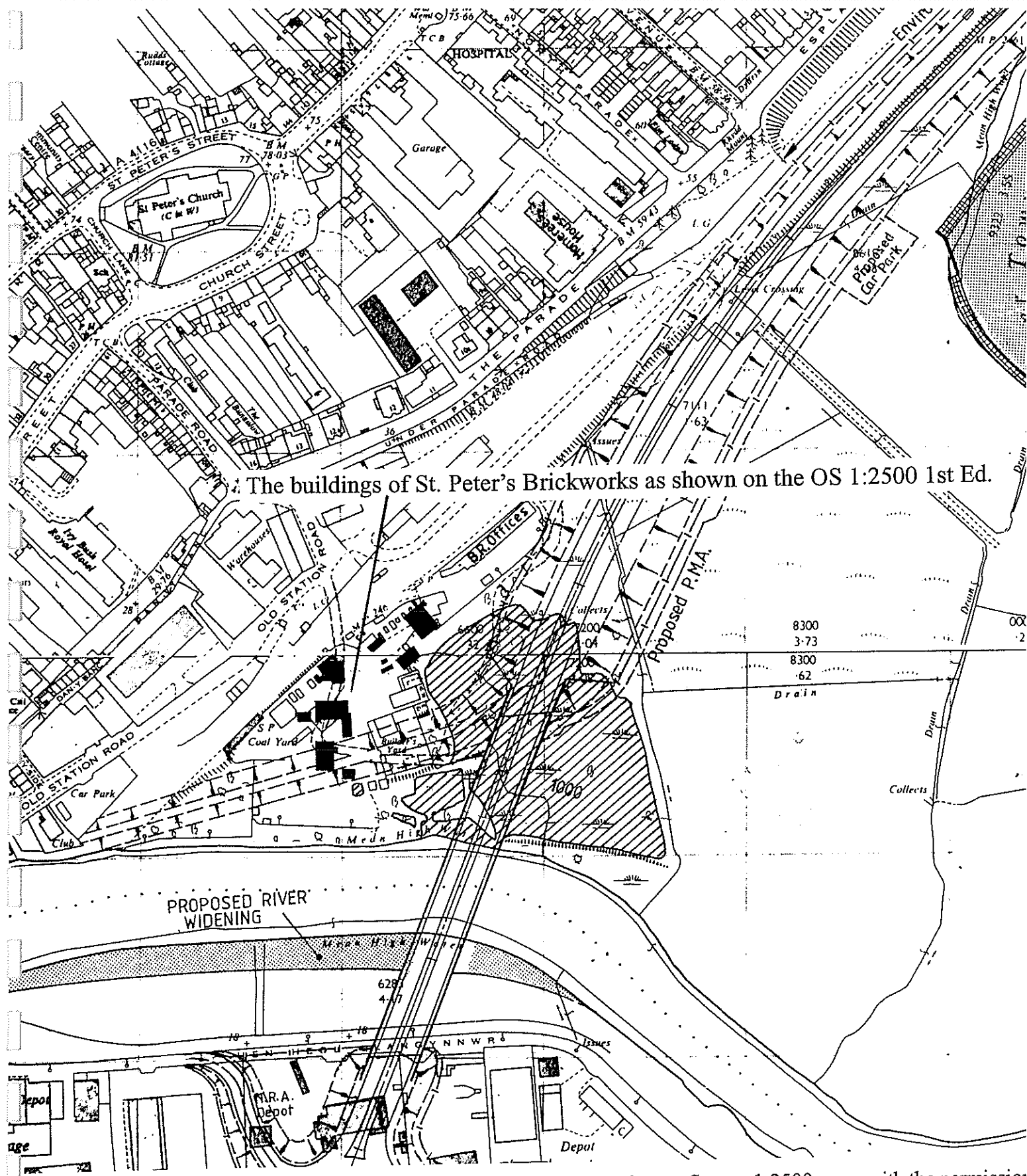


PRN 87 SITE OF BRICKWORKS, CLAY PIT AND SAW MILL

EXTRACT OF THE OS 1:2500 1ST ED. CARMARTHEN XXXIX.7
(SURVEYED 1886)

SCALE 1:2500

Figure 8



The buildings of St. Peter's Brickworks as shown on the OS 1:2500 1st Ed.

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PRN 87 SITE OF BRICKWORKS, CLAY PIT AND SAW MILL
 INFORMATION FROM OS 1:2500 1ST ED. CARMARTHEN XXXIX.7
 (SURVEYED 1886)

SCALE 1:2500

Figure 9

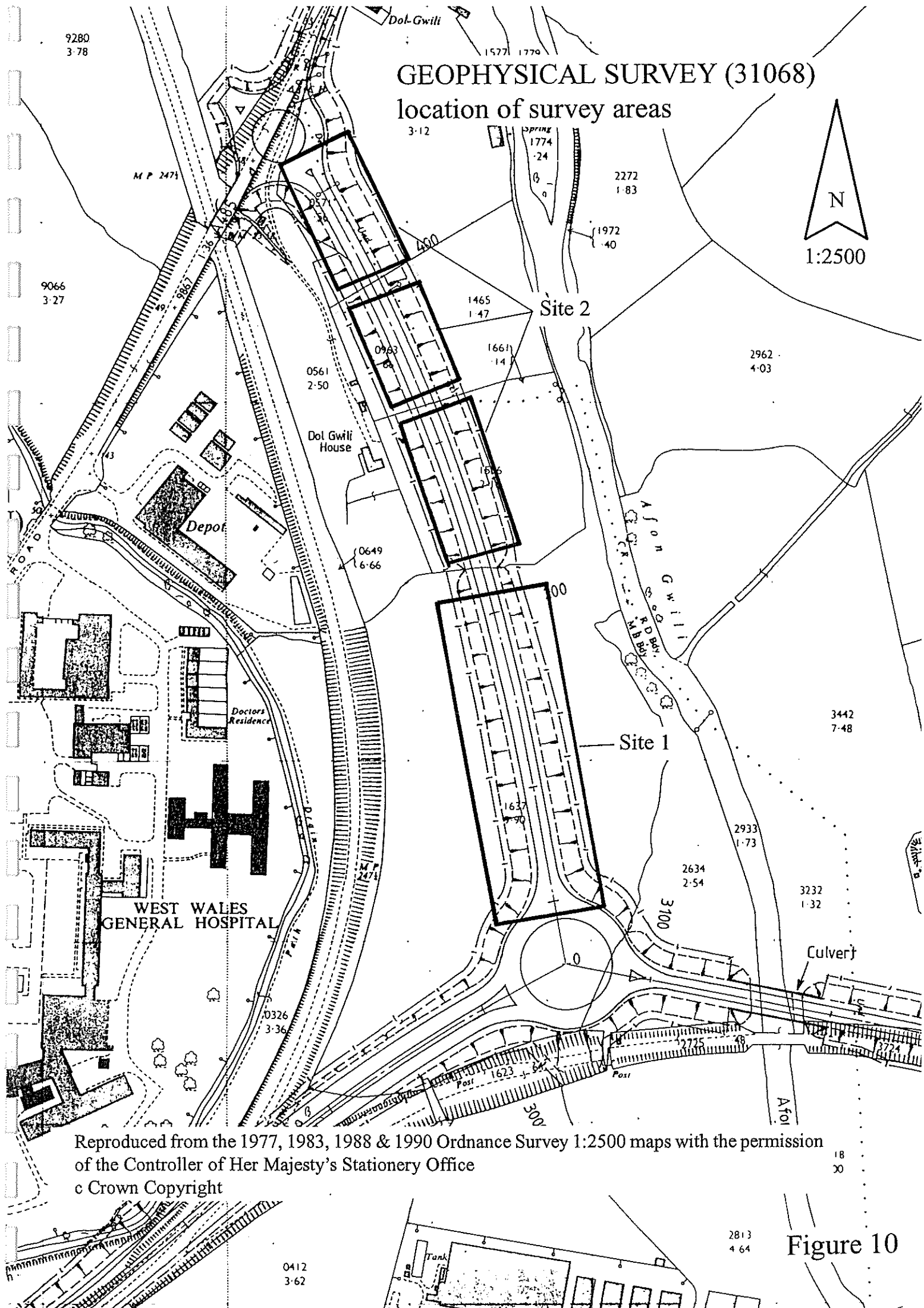


Figure 10

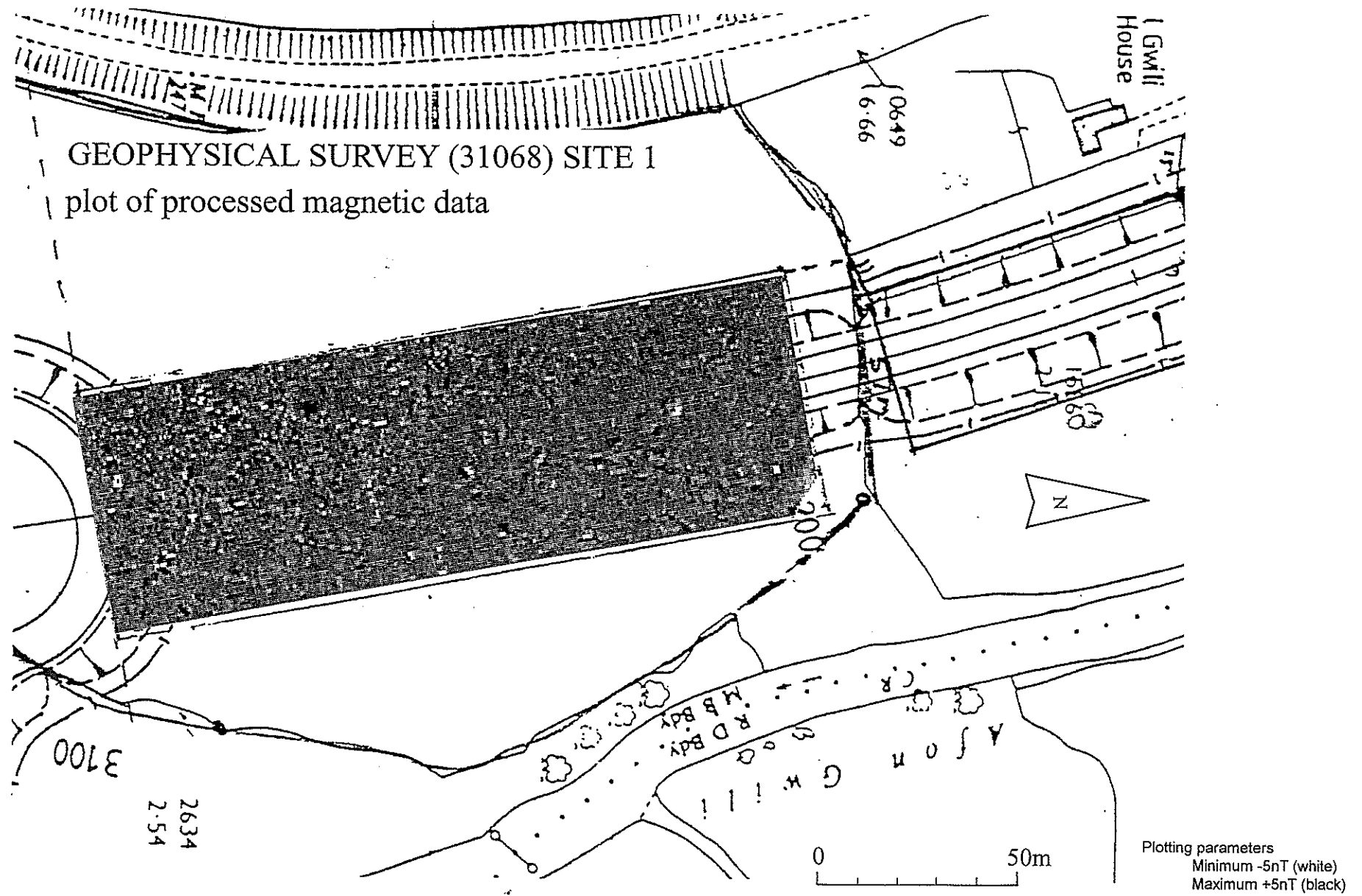


Figure 11

GEOPHYSICAL SURVEY (31068) SITE 1 abstractions of anomalies

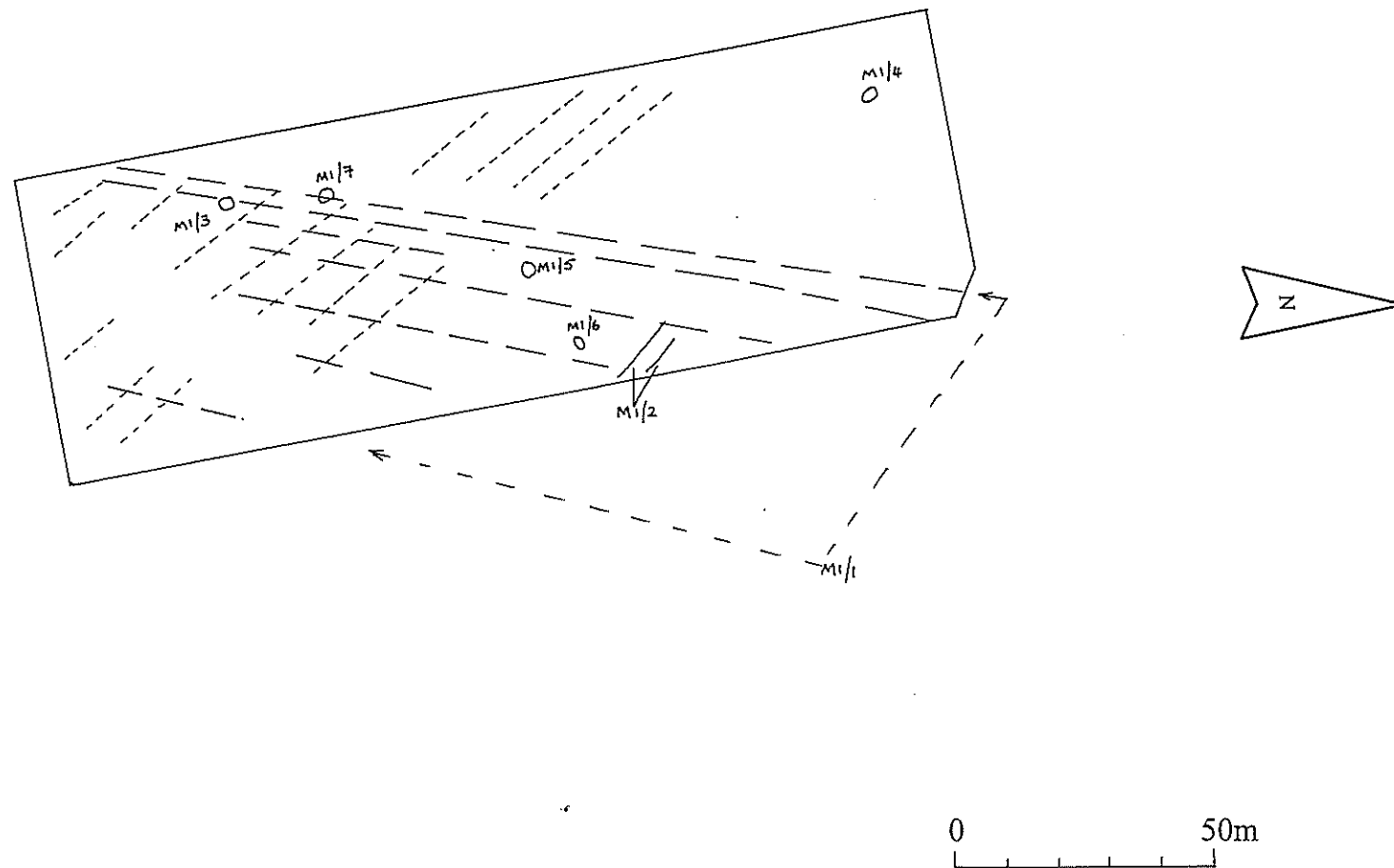


Figure 12

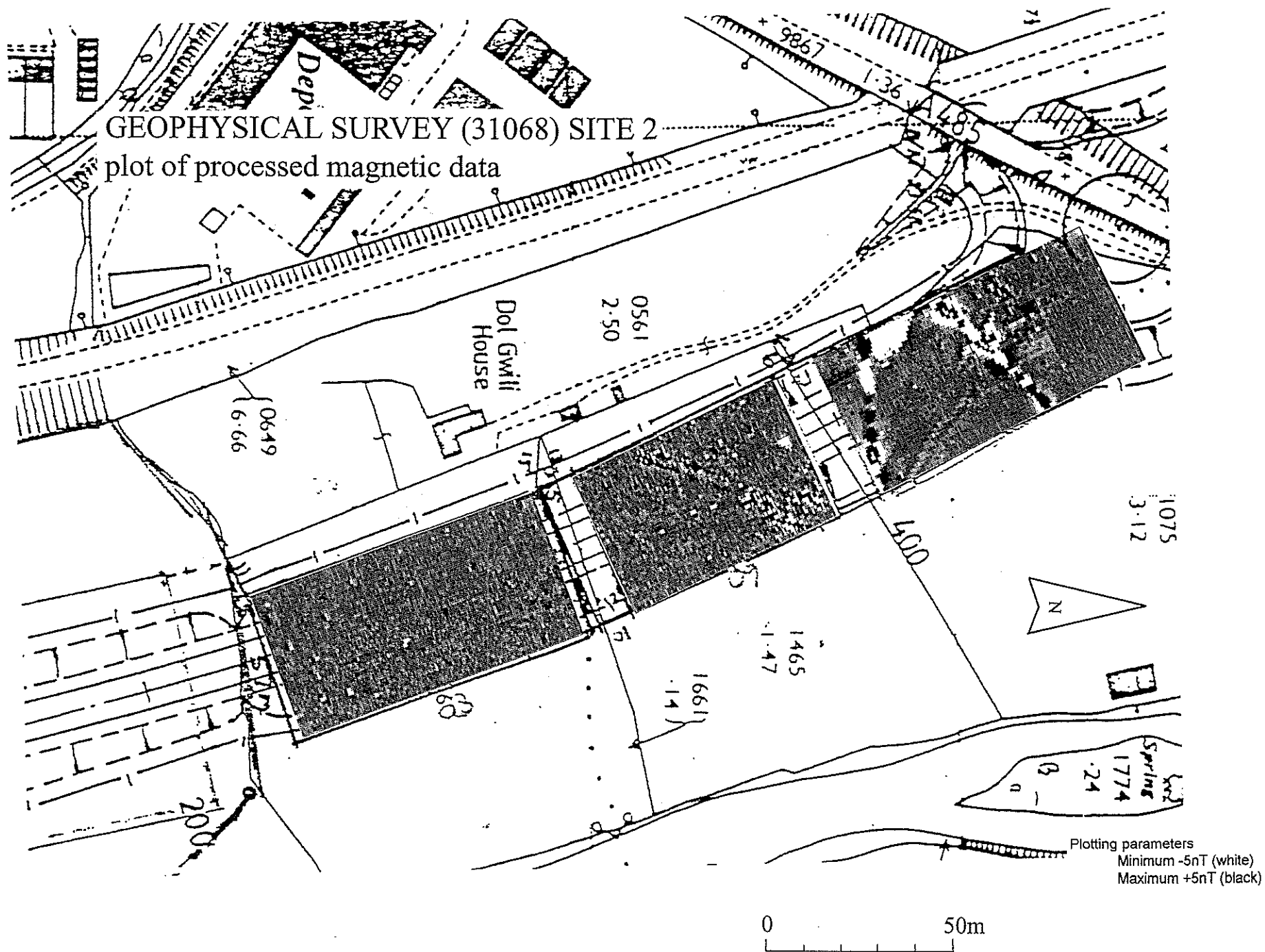


Figure 13

GEOPHYSICAL SURVEY (31068) SITE 2
abstractions of anomalies

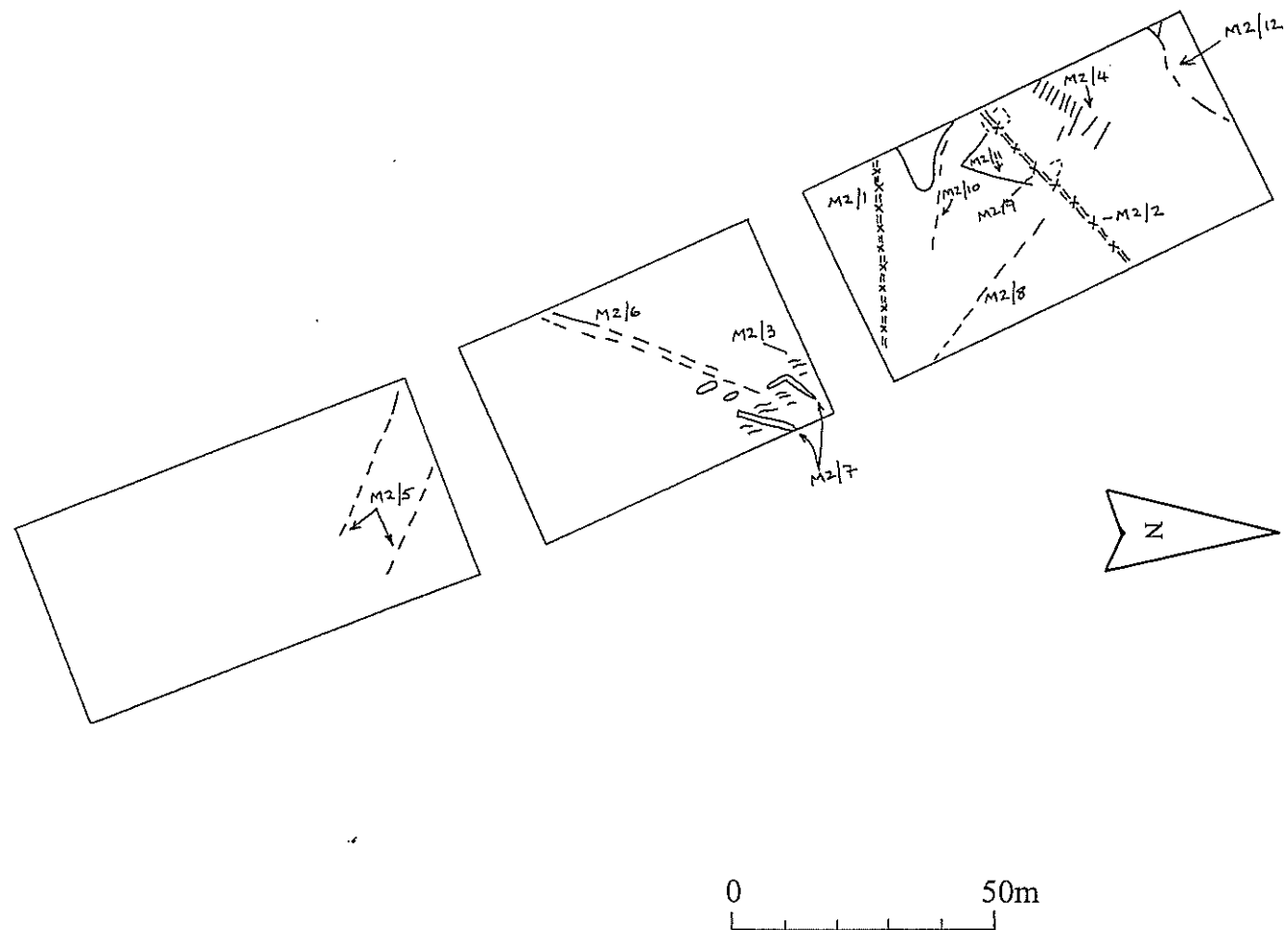


Figure 14

TINPLATE WORKS (82)

location plan showing position of trial trenches

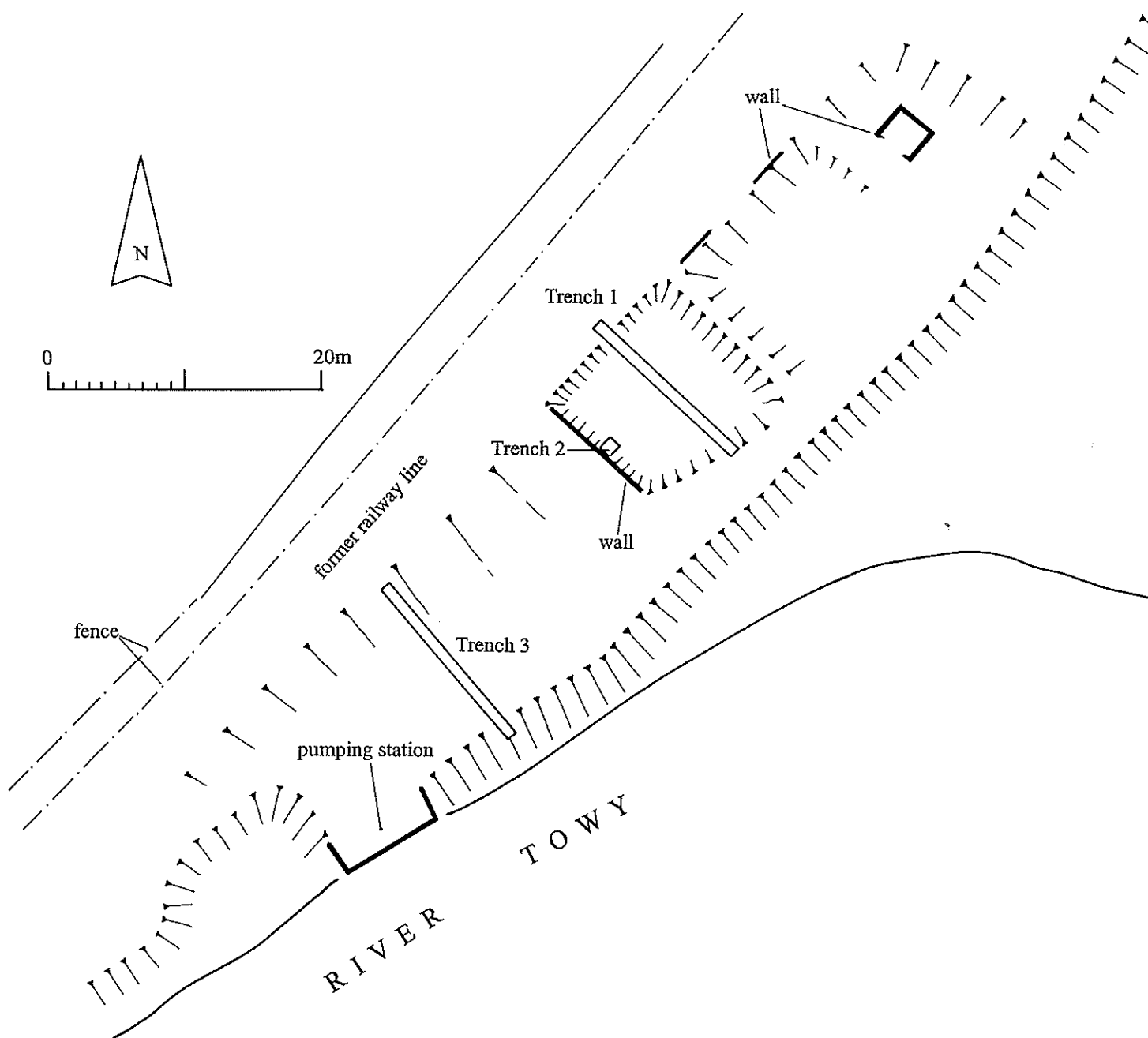
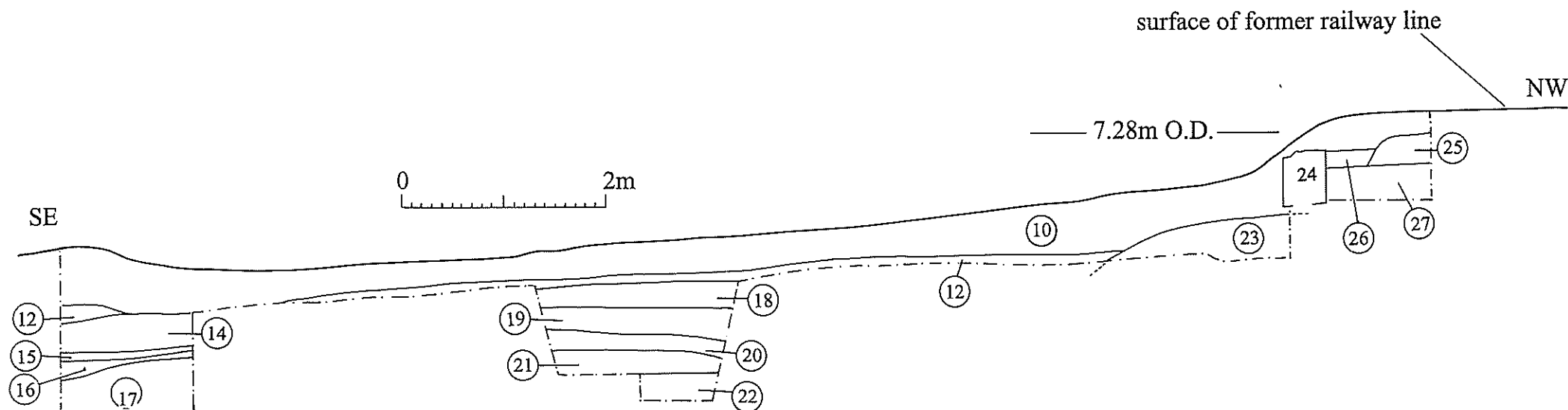


Figure 15

TINPLATE WORKS (82)

section of Trench 1



10. Topsoil

12. Dark orange-brown silty-loam with 20% gravel and small stones and occasional pieces of coke.

14. Very dark brown/black silty-clay with a very high percentage of coal fragments, mortar, brick, slag and stones.

15. A clean layer of purple coloured sand, possibly foundry sand.

16. Layer of broken brick and shattered mortar.

17. Very dark brown silty-clay with a very high percentage of clinker, slag, coal, coke, brick fragments and coal.

18. Very dark brown silty-loam with a very high percentage of clinker, coke, coal and brick and mortar fragments.

19. Brown silty-clay with a high percentage of small- to medium-sized river pebbles.

20. Grey silty-sand with a high percentage of clinker, brick and mortar.

21. A layer of clinker and broken brick and mortar.

22. Light brown silty-clay with a high percentage of clinker and rounded stones.

23. Very compact and fused layer of clinker and furnace residue.

24. Stone wall.

25. Layer of coal dust, coke and mortar fragments.

26. Black silty-clay containing a high percentage of clinker, slag and mortar fragments.

27. Dark brown silty-clay loam with 20% brick fragments, clinker and pieces of mortar.

Figure 16

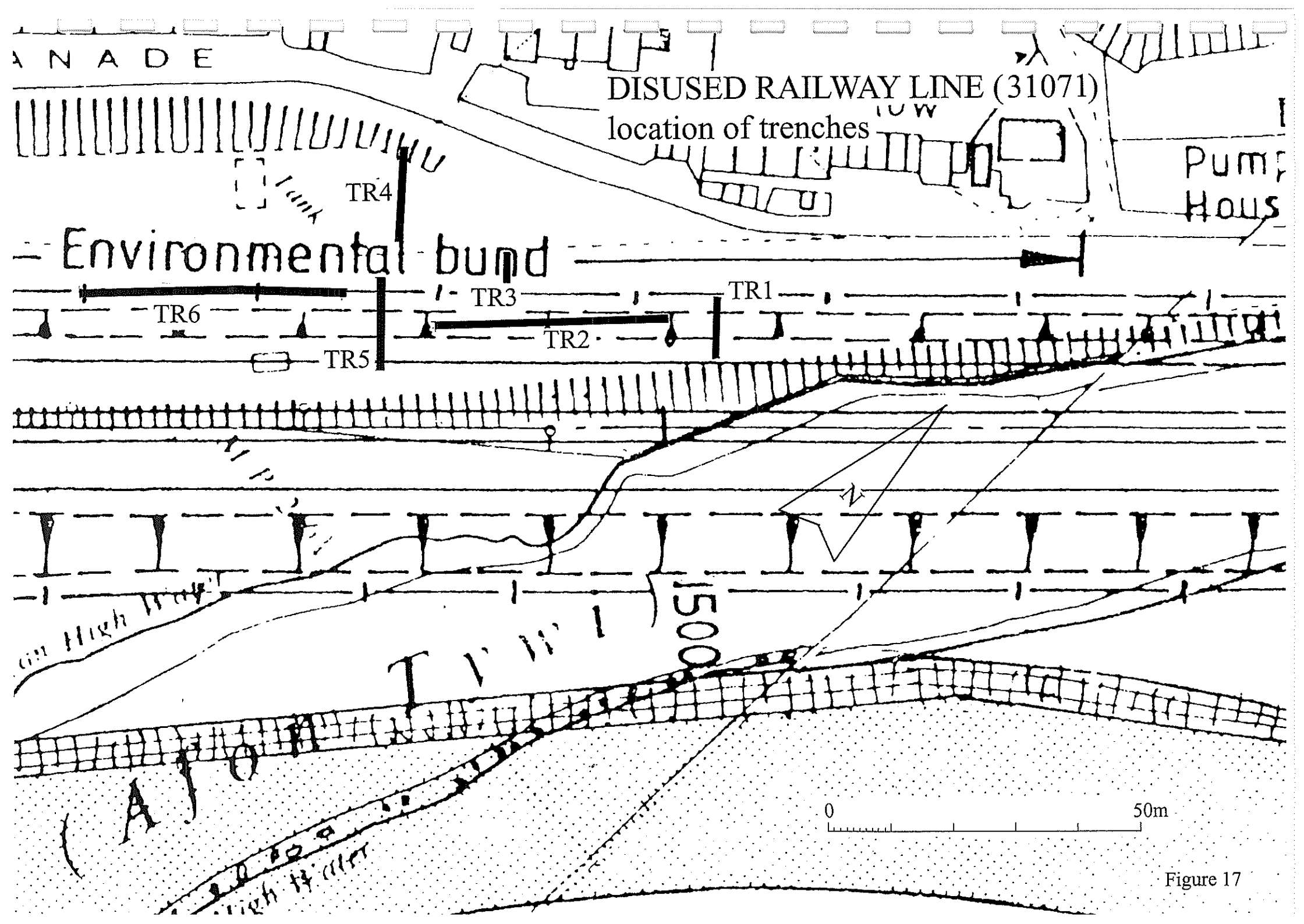
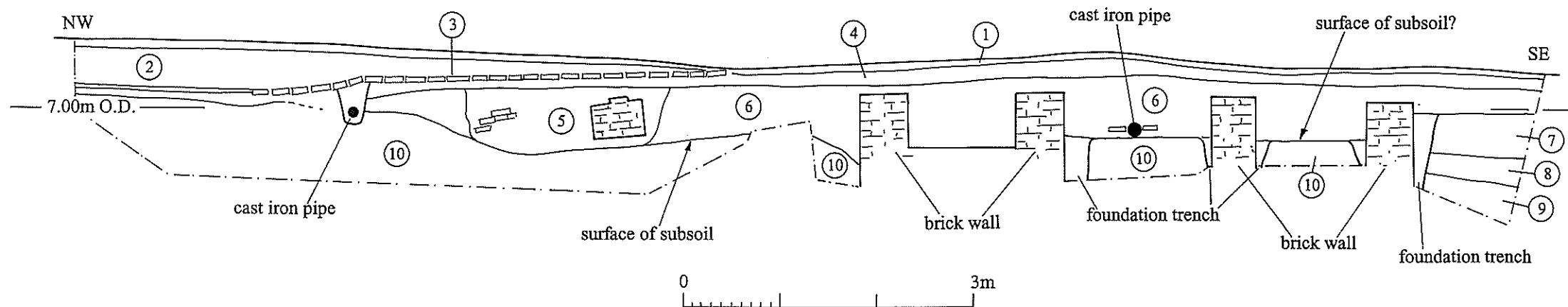


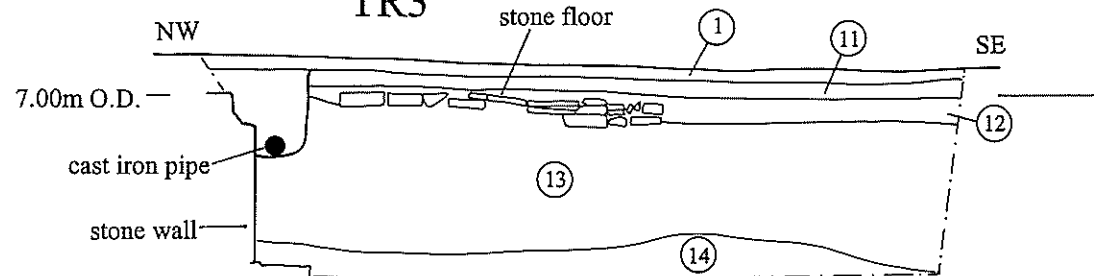
Figure 17

TR4



DISUSED RAILWAY LINE (31071) sections of trenches TR3, TR4, TR5

TR3



TR5

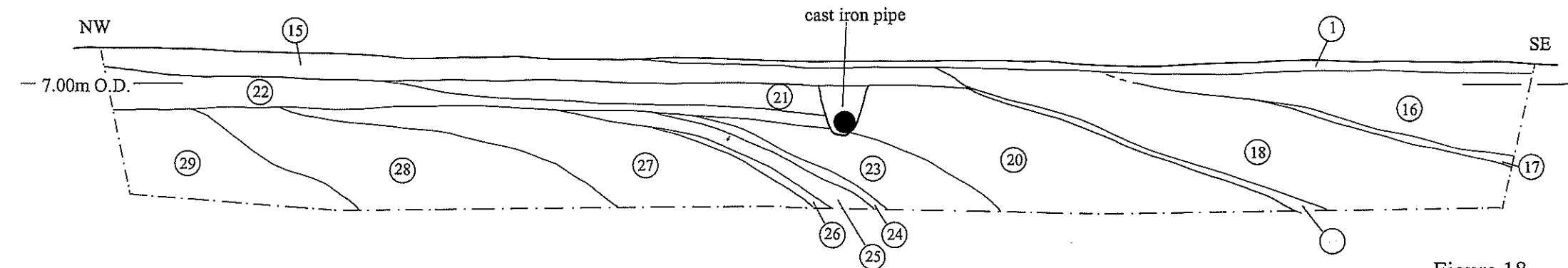
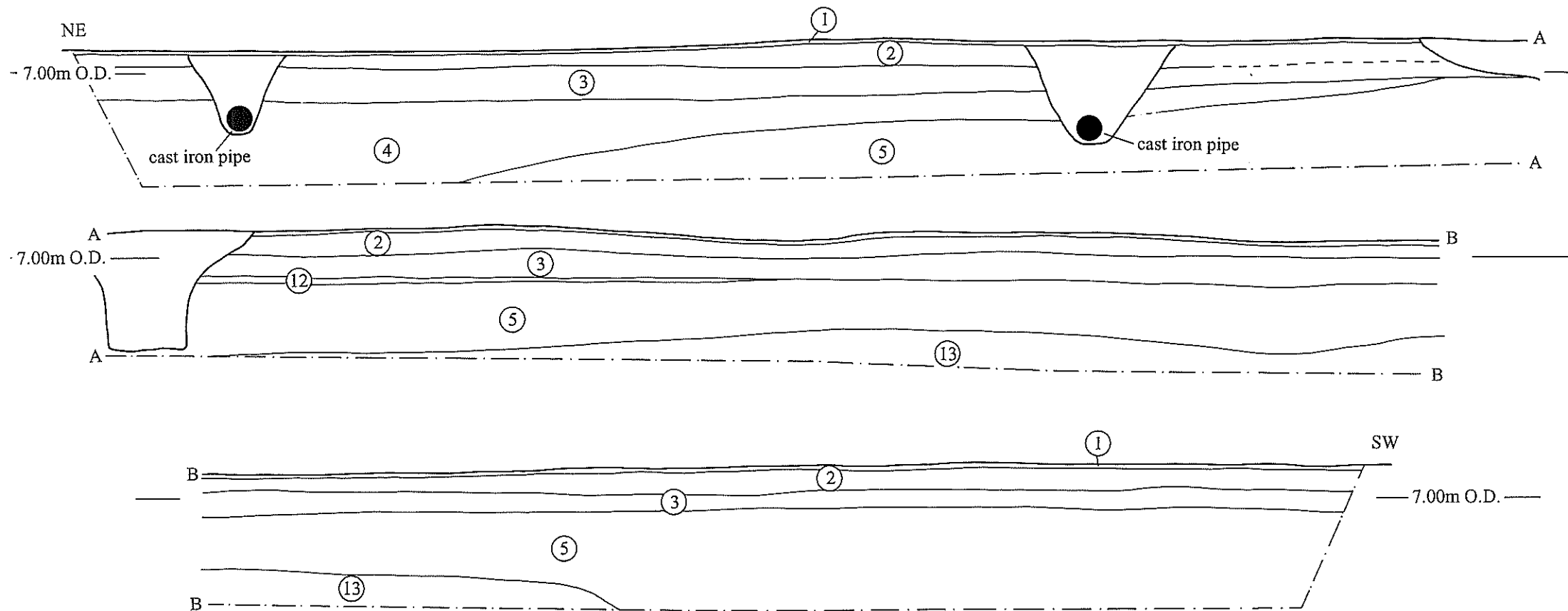


Figure 18

DISUSED RAILWAY LINE (31071) section of trench TR6

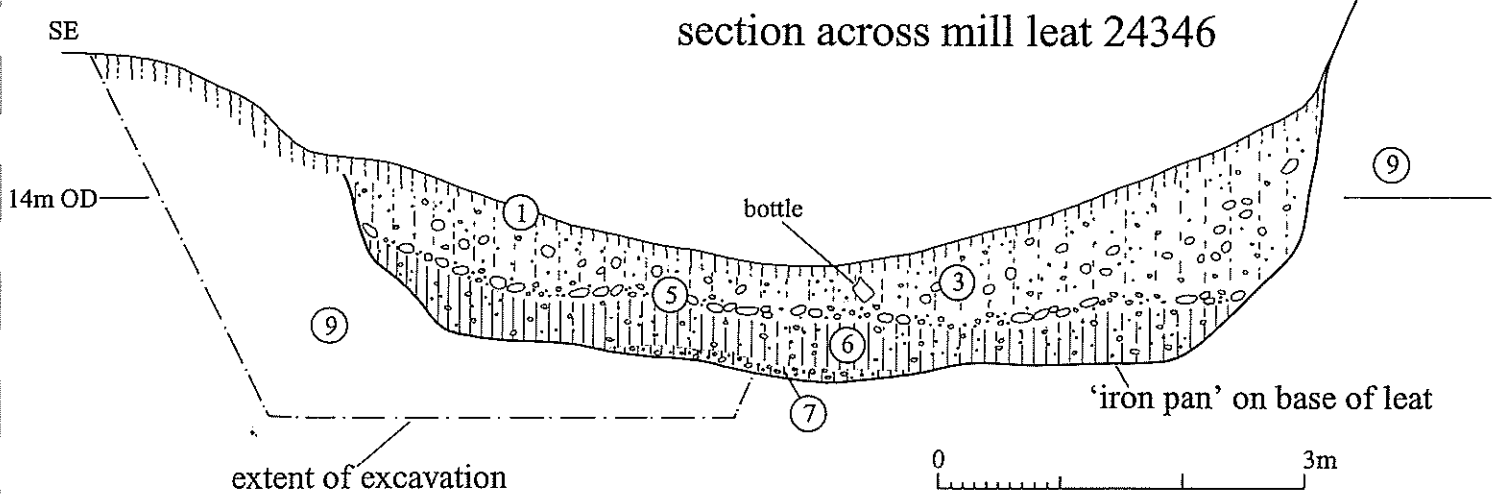
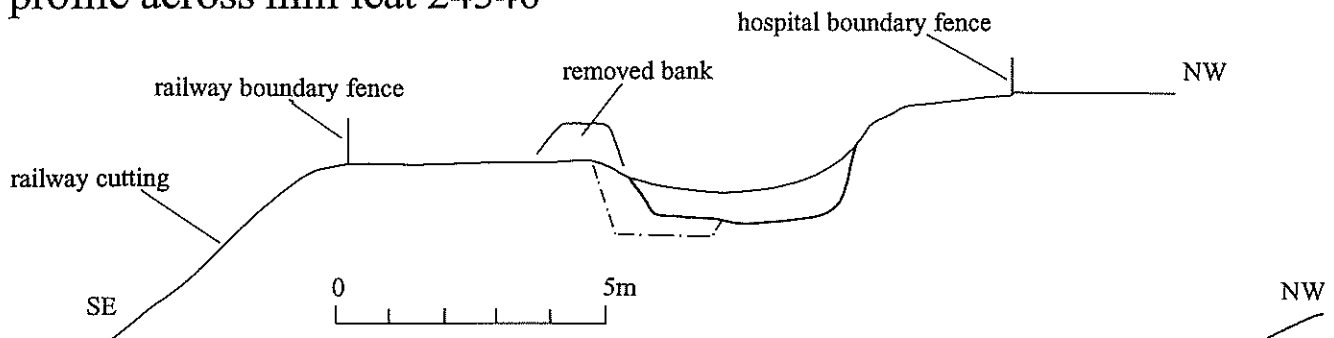


1. Layer of railway ballast with a scattering of brick and slag.
2. Dark brown, humic silty-clay loam with a high percentage of angular stones and slag.
3. Very dark brown silty-clay loam with a high percentage of angular stones and slag.
4. Grey silty-clay.
5. Yellowish-brown silty clay with 60% small angular stones.
12. Greyish-brown silty-clay.
13. Grey silty-clay with 20% small rounded stones.



Figure 20

profile across mill leat 24346



1. Topsoil

3. Grey silty loam with c. 40% small rounded stones and sherds of 19th and 20th century pottery and glass. A concentration of artefacts and iron staining from decayed objects on the SE side of this layer are from rubbish dumping.

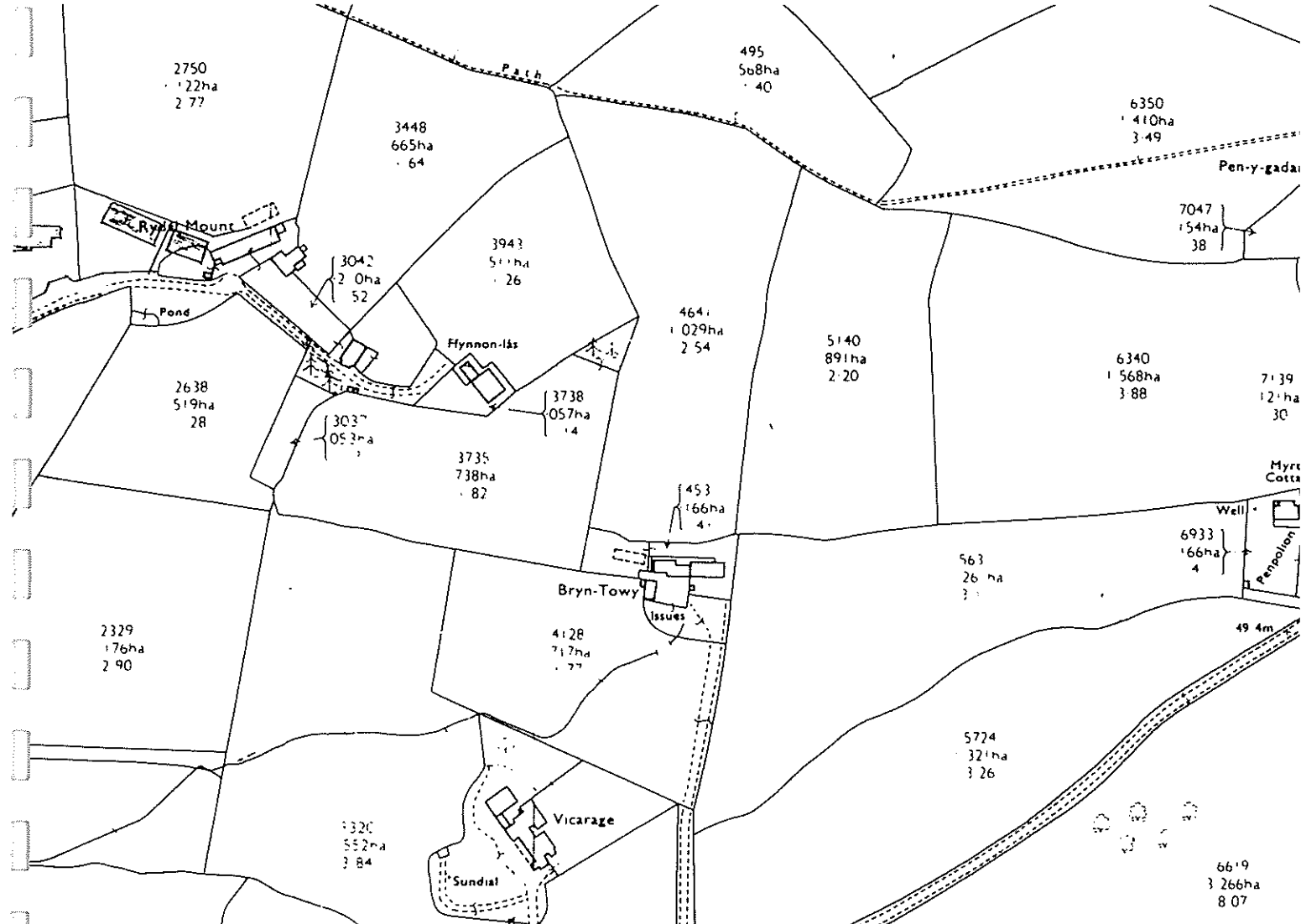
5. Very compact layer comprising c. 60% large rounded stones and cobbles in a clay matrix over which is a grey silty clay. A sherd of 19th century pottery came from this layer. It is possible that this stone and clay layer represents re-lining of the leat after primary silting of contexts 6 and 7.

6. Grey silty clay with gravel and small rounded stones.

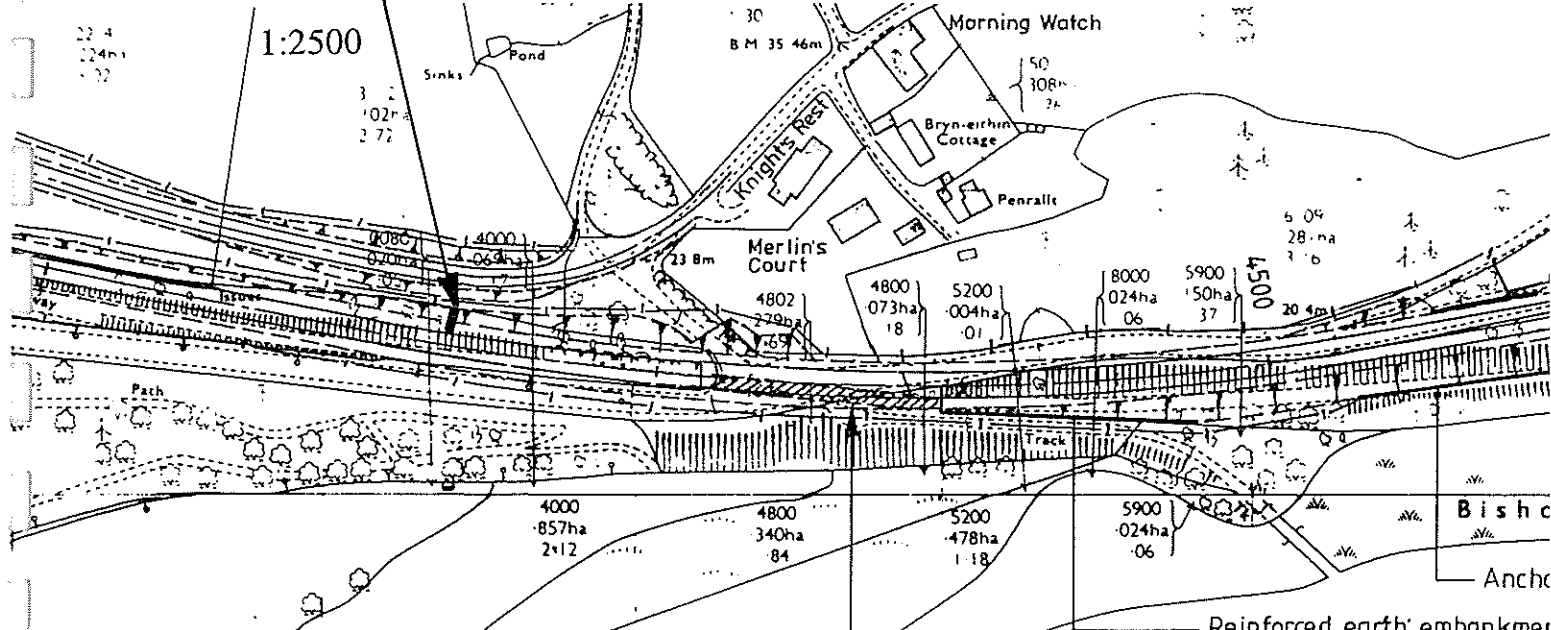
7. Grey silty clay with c. 60% small and medium sized rounded stones

9. Subsoil. Rounded stones, cobbles and gravel.

Figure 22



location of trench at Bryn Eithin earthwork (PRN 31070)



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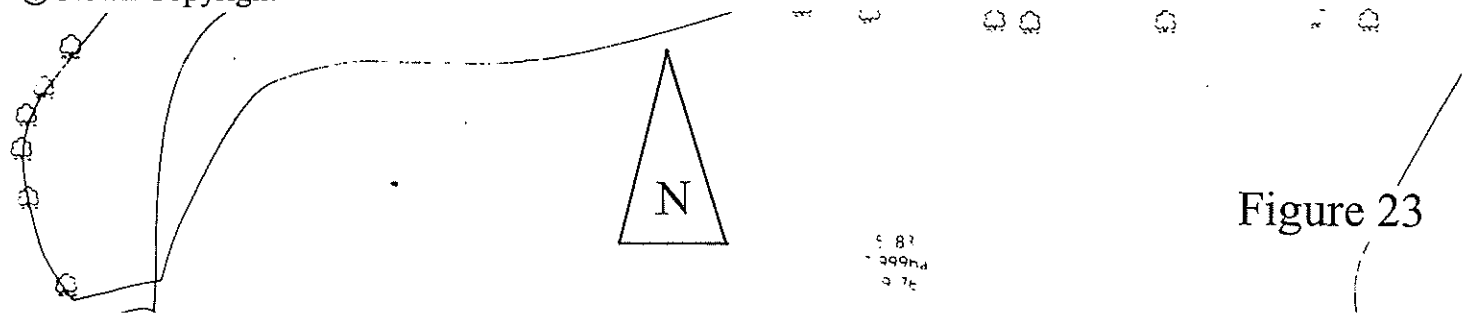
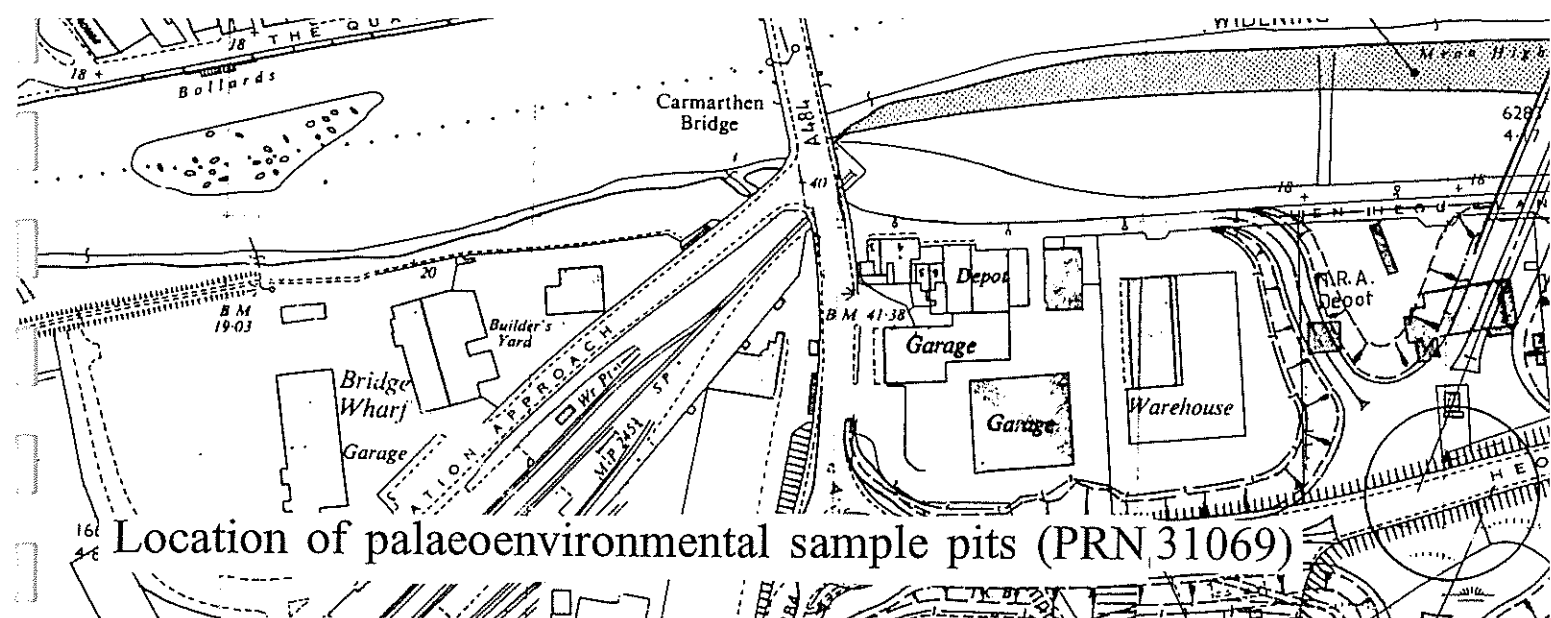


Figure 23



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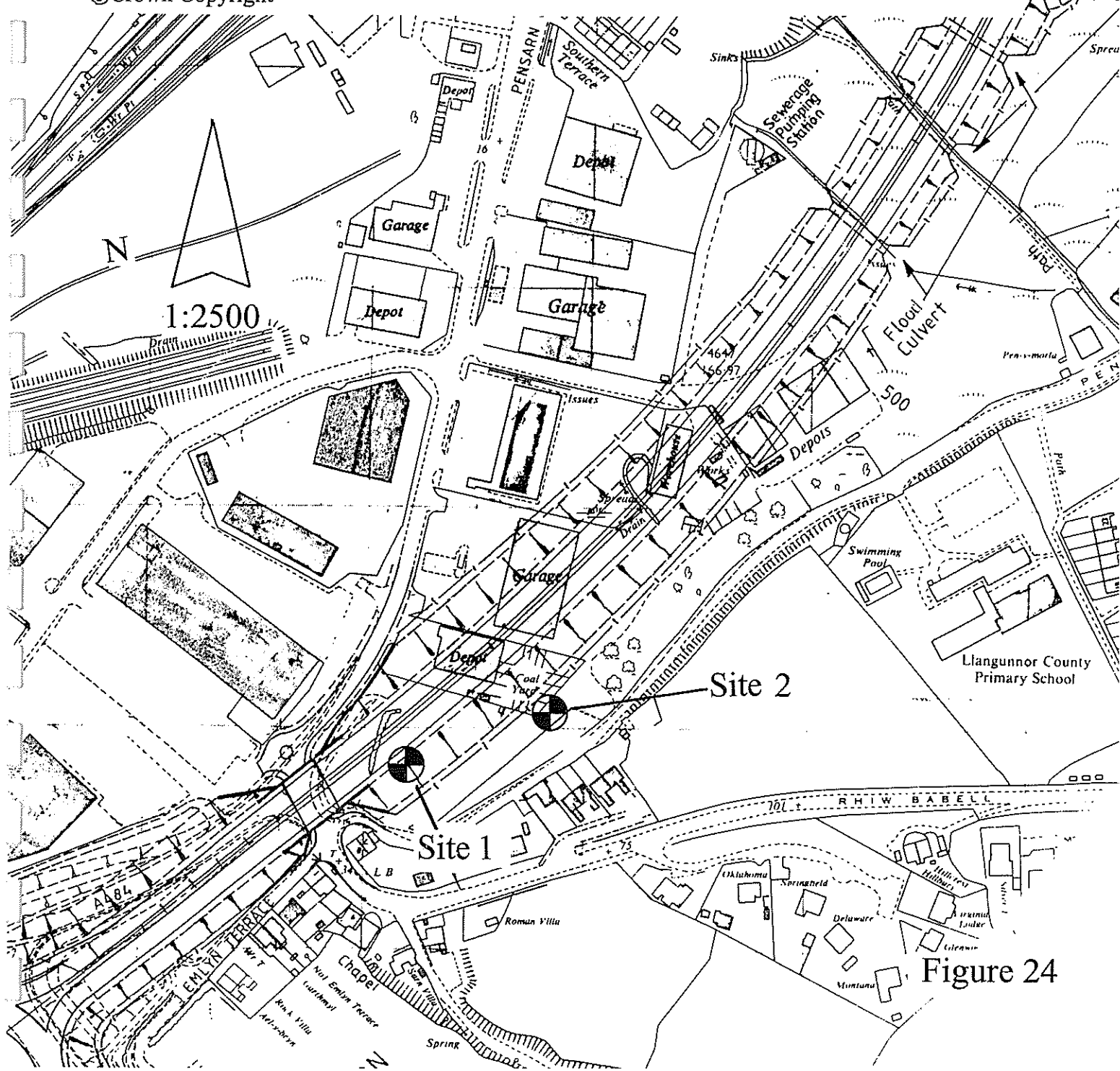
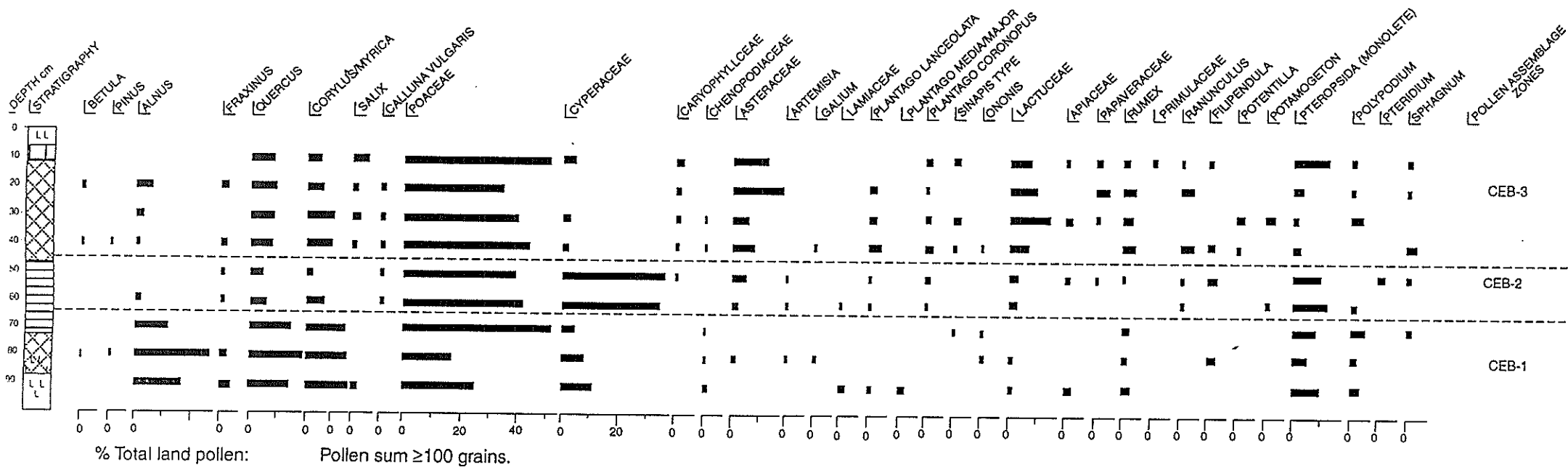
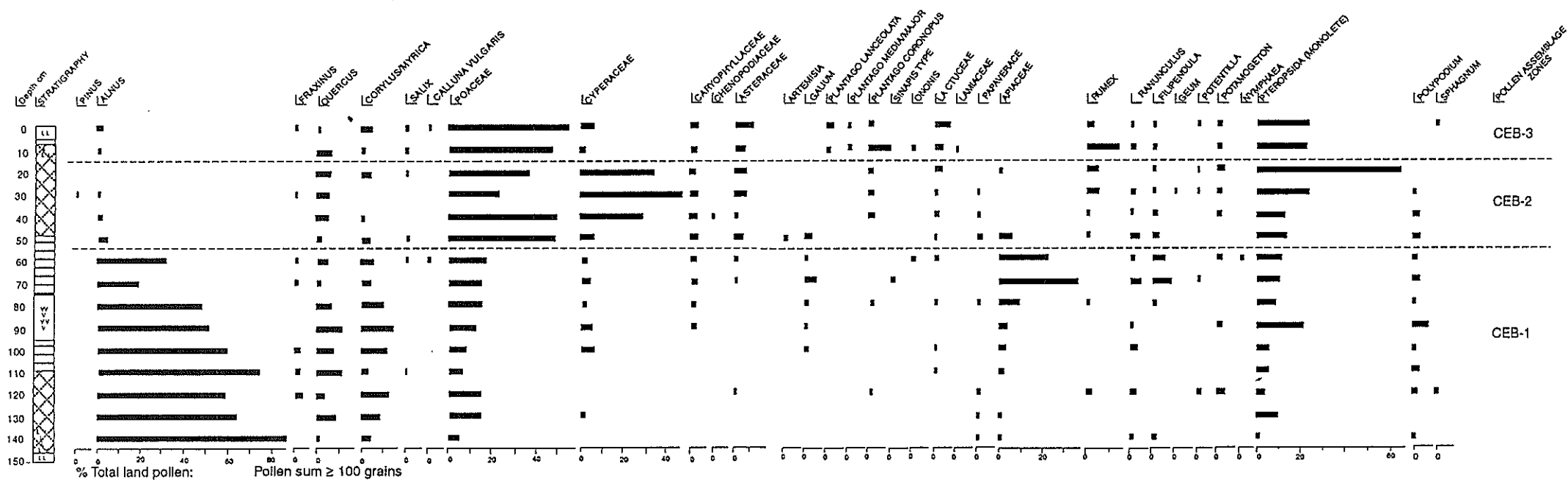


Figure 24



Palaeoenvironmental analysis: pollen diagram from Site 1



Palaeoenvironmental analysis: pollen diagram from Site 2

Table 1: The plant remains from Site 1

	90cm	80cm	70cm	60cm	50cm	40cm	30cm	20cm	10cm
Minerogenic material	+	+	+	-	-	+	+	+	+
Wood frags.	-	+	-	-	-	-	-	-	-
Dicot. leaf frag.	-	+	-	-	-	-	-	-	-
Monocot. remains	+	+	+	+	+	+	+	+	+
Moss	-	-	-	+	+	+	+	-	-
Charcoal	-	+	-	-	-	-	-	-	-
<i>Ranunculus</i> sp.	-	-	-	-	-	2	1	-	-
<i>Montia fontana</i> L.	-	-	-	-	-	1	-	-	-
<i>Sagina</i> type	-	-	-	-	-	3	1	-	-
<i>Lychnis flos-cuculi</i> L.	-	-	-	-	1	-	-	-	-
<i>Mentha</i> sp.	-	1	-	-	-	-	-	-	-
<i>Juncus</i> sp.	66	103	11	2	1	8	16	43	9
<i>Carex</i> sp. - biconvex	-	-	-	2	2	-	-	-	1
Poaceae	-	2	1	-	-	-	1	-	1
Foraminifera	+	-	-	-	-	-	-	-	-
Insects	+	+	+	+	+	+	+	+	+
cf. Cladocera	-	+	+	+	+	+	+	-	-

Table 2: The plant remains from Site 2

	140cm	130cm	120cm	110cm	100cm	90cm	80cm	70cm
Minerogenic material	+	-	+	-	+	-	+	+
Wood frags.	+	+	+	+	+	+	-	+
Dicot. leaf frags.	+	+	+	+	+	+	+	+
Monocot. remains	+	+	+	+	+	+	+	+
Moss	+	-	+	+	-	-	-	-
Charcoal	-	-	-	-	-	-	-	-
<i>Ranunculus</i> sp.	-	-	-	-	-	-	-	-
<i>Urtica dioica</i> L.	-	-	-	-	-	1	-	-
<i>Stellaria/Cerastium</i> type	-	-	-	-	1	-	-	-
<i>Sagina</i> type	-	-	-	-	1	-	-	-
<i>Alnus</i> fruits	-	1	-	1	8	-	1	-
<i>Alnus</i> cone	-	-	-	-	-	-	1	-
<i>Alnus</i> cone frags	8	-	5	-	-	-	-	-
<i>Alnus</i> cone-scales	4	4	2	-	-	-	1	-
<i>Rumex</i> sp.	-	-	-	1	1	-	-	-
<i>Persicaria</i> sp.	-	-	-	-	-	-	-	-
Brassicaceae	-	1	-	-	2	1	2	1
<i>Rubus</i> sp. frags	-	-	-	-	-	-	2	-
Apiaceae	-	-	-	-	-	-	-	2
<i>Juncus</i> sp.	-	-	-	-	-	-	-	-
<i>Carex</i> sp. biconvex	-	-	-	-	-	-	-	-
Poaceae	-	-	-	-	-	-	-	1
Scale	-	1	1	1	3	-	-	-
Fern sporangia	+	+	+	+	+	+	+	+
Insects	+	+	+	+	+	+	+	+
Mites	-	-	-	+	-	+	+	-
cf. Cladocera	-	+	+	-	+	+	+	+

	60cm	50cm	40cm	30cm	20cm	10cm	0cm
Minerogenic material	+	+	+	+	+	+	+
Wood frags.	+	-	-	-	-	-	-
Dicot. leaf frags.	+	-	-	+	-	-	-
Monocot. remains	+	+	+	+	+	+	-
Moss	-	+	+	+	+	+	-
Charcoal	+	-	-	-	-	-	+
<i>Ranunculus</i> sp.	-	-	1	-	-	-	-
<i>Urtica dioica</i> L.	1	-	-	-	-	-	-
<i>Stellaria/Cerastium</i> type	1	4	2	2	3	-	-
<i>Sagina</i> type	-	-	1	-	-	-	-
<i>Alnus</i> fruits	-	-	-	-	-	-	-
<i>Alnus</i> cone frags	-	-	-	-	-	-	-
<i>Alnus</i> cone-scales	-	-	-	-	-	-	-
<i>Rumex</i> sp.	-	-	-	-	-	-	-
<i>Persicaria</i> sp.	1	-	-	-	1	-	-
Brassicaceae	3	-	-	-	-	-	-
<i>Rubus</i> sp. frags	-	-	-	-	-	-	-
Apiaceae	-	-	-	-	-	-	-
<i>Juncus</i> sp.	-	100+	1	1	1	1	13
<i>Carex</i> sp. biconvex	-	-	1	1	-	-	-
Poaceae	-	3	-	-	-	-	-
Scale	-	-	-	-	-	-	-
Fern sporangia	+	+	+	+	+	-	-
Insect	+	+	+	+	+	+	+
Mites	+	-	-	+	-	+	-
cf. Cladocera	+	+	+	+	+	+	-