

ARCHAEOLOGICAL STRIP, MAP AND RECORD REPORT:
STARTIN TRACTORS, ASHBY ROAD, TWYXCROSS, LEICESTERSHIRE

Planning Reference: 21/00427/FUL
NGR: SK 33679 05218
AAL Site Code: TWAR 22
Museum Accession Number: X.A81.2022
OASIS Reference Number: allenarc1-508651



Report prepared for Startin Tractors

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Report Number AAL 2022104

July 2023



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Document Control

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Version no.:	3.0	07/07/2023

Cover image: General shot of the site looking southeast

Executive Summary

- Startin Tractors commissioned Allen Archaeology Limited to undertake a programme of archaeological mitigation at Startin Tractors, Ashby Road, Twycross, Leicestershire, required as a condition of planning consent for the addition of a workshop and ancillary services building, wash bay building and a change in land use to create a display area for agricultural machinery.
- Prehistoric activity has been noted in the area as Iron Age coins have been found northeast of Little Twycross and a trackway is believed to be located to the north of Bilstone Road. Roman pottery has been found to the east of Twycross church and from 1 Flax Lane. Two suspected Roman sites lie off Sheepy Road and east of Lea Grange Farm. An Anglo-Saxon brooch has also been found east of Lea Grange Farm. Near to the development, approximately 200 metres to the southeast of the site, is a medieval moated site with three fish ponds and several enclosures and upstanding earthworks relating to the medieval settlement of 'Little Twycross'. Trial trenching prior to strip, map and record, was undertaken, comprising six archaeological trenches (Williams 2022). The works recorded two possible field boundaries and a drainage gully, a possible pit and made ground across the southern part of the site.
- A c.690m² strip, map and record area was agreed as final mitigation, and exposed four phases of activity, comprising pits, boundary ditches and a possible trackway. Relative dating evidence was provided only by a small assemblage of 11th to 13th century pottery from a feature attributed to Phase 2. Subsequent radiometric dating provided four radiocarbon ages refining the chronology to the late 12th/early 13th century. The evidence suggests the site lies on the periphery of a medieval settlement area, associated with a medieval manor c.200m to the southeast.
- Despite the archaeological features being few and little dating material being obtained, the archaeobotanical assemblage is of significance as the remains were mostly in good condition and abundant. As a result, further work was undertaken to understand the environmental remains more fully. This revealed evidence of intentional dumping of waste associated with the use of crop processing by-products as fuel, likely in the drying of grain in oven or kilns prior to milling, as well as evidence of crop rotation regime and other techniques for improving soil fertility.

1.0 Introduction

- 1.1 Startin Tractors commissioned Allen Archaeology Limited (AAL) to carry out a programme of strip, map and record at Startin Tractors, Ashby Road, Twycross, Leicestershire as a condition of planning consent for the addition of a workshop and ancillary services building, wash bay building and a change in land use to create a display area for agricultural machinery.
- 1.2 All site work and reporting has been undertaken in accordance with current national guidelines, as set out in the Chartered Institute for Archaeologists (CIfA) *Standard and Guidance for Archaeological Excavation* (2014), the Historic England document *Management of Research Projects in the Historic Environment* (2015), and a specification prepared by this company (AAL 2022).
- 1.3 The documentary and physical archive generated by the strip, map and record will be assembled in accordance with the national guidelines in *Archaeological Archives: A guide to best practice in creation, compilation, transfer and curation* (Brown 2011), *Standard and guidance for the creation, compilation, transfer and deposition of archaeological archives* (CIfA 2020) and the local guidelines set out in *Leicestershire Museums and Galleries Collections Development Policy 2019 - 2024* (Leicestershire City Council 2019). The archive will be submitted to the Leicestershire County Council Museums Collection under museum accession code X.A81.2022 within twelve months of the completion of the work.

2.0 Site Location and Description

- 2.1 The site is located to the east of Ashby Road in Twycross, Leicestershire, approximately 6.6km northwest of Market Bosworth. The proposed development area extends to c.1.6ha and is a sub-rectangular parcel of land, occupied in-part by an agricultural machine sales yard and showroom (Figure 1). The site centres on NGR SK 33679 05218 and is at a height of between 124.7m aOD in the north and 125.9m aOD in the south.
- 2.2 The underlying geology comprises mudstone of the Gunthorpe Member, overlain by superficial Mid Pleistocene Glaciofluvial deposits of sand and gravel (<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>).

3.0 Planning Background

- 3.1 Planning permission (21/00427/FUL) has been granted for the erection of a new workshop and ancillary services building, new wash bay building and change of land use to create an agricultural machinery display area.
- 3.2 The application was approved with conditions. Condition 13 stated:

No demolition/development shall take place/commence until a written scheme of investigation (WSI) has been [submitted to and] approved by the local planning authority in writing. For land that is included within the WSI, no demolition/development shall take place other than in accordance with the agreed WSI, which shall include the statement of significance and research objectives, and

- The programme and methodology of site investigation and recording and the nomination of a competent person(s) or organisation to undertake the agreed works.

- The programme for post-investigation assessment and subsequent analysis, publication & dissemination and deposition of resulting material. This part of the condition shall not be discharged until these elements have been fulfilled in accordance with the programme set out in the WSI.

- 3.3 William Kelly, Senior Planning Archaeologist at Leicestershire County Council, advised that further archaeological work was required to discharge Condition 13, consisting of an archaeological strip, plan and record. An area was agreed as final mitigation, based on preceding trial trenching, and incorporated into the WSI (AAL 2022).
- 3.4 The approach adopted is consistent with the guidelines set out in the National Planning Policy Framework (NPPF), with the particular chapter of relevance being 'Section 13. Conserving and enhancing the historic environment' (Department for Levelling Up, Housing and Communities 2021) and in accordance with Policies DM11, DM12 and DM13 of the adopted Site Allocations Development Management Policies Development Plan Document (Hinckley & Bosworth Borough Council 2016).

4.0 Archaeological and Historical Background

- 4.1 The archaeological and historical background outlined below is in part derived from a desk-based assessment for the site (Williams 2020) with additional information as a result of recent archaeological investigations on the site.
- 4.2 Prehistoric activity has been noted in the area as a trackway is believed to be located to the north of Bilstone Road, c.177m from the site (MLE19732)
- 4.3 Roman pottery has been found to the east of Twycross church, c.500m southeast of the development area (MLE9398) and from 1 Flax Lane (MLE16955), c.500m south-southeast of the site. A suspected site lies off Sheepy Road (MLE8397) and east of Lea Grange Farm, c.960m west-northwest of the current development (MLE8643).
- 4.4 An Anglo-Saxon brooch has also been found east of Lea Grange Farm, also c.960m from the proposed development (MLE8643).
- 4.5 Twycross is mentioned as *Tuicros* in Domesday Book (Williams and Martin 2002). At the time of the Domesday Survey, it was inhabited by 11 villans (villagers), 6 bordars (smallholders) and 1 slave. The place name consists of two elements *twi-* meaning 'double, two', and *cross* meaning 'cross' (Nottingham University 2022). The element *cross* in place-names usually refers to a carved stone cross. The name may refer to two crosses, neither of which has survived.
- 4.6 A well preserved medieval moated site is located approximately 200m southeast of the site (MLE3271, SM1012524). The site has suffered very little disturbance and therefore the earthworks are well defined, which include the moated area and associated fishponds.
- 4.7 A group of sites located close to and within the vicinity of the moated manor site along Church Street have produced evidence for medieval archaeology in the form of ditches, post-holes, gullies, pits and a pond (MLE10079). Fieldwork at 1 Main Road on the opposite side of the road to the moated manor was of a similar character, with pits and ditches dated by the pottery to the medieval period (Collins 2017). To date, however there has been no archaeological evidence for medieval structures found on any of the excavated sites. The extent and layout of the medieval settlement at Twycross and its relationship to the moated manor is not fully understood.

- 4.8 Prior to the current works a programme of trial trenching was undertaken, comprising six trenches (Williams 2022). The works recorded two possible field boundaries and a drainage gully, a possible pit and made ground across the southern part of the site. All were undated. The strip map and record area was centred on Trench 2, which contained two northeast-southwest orientated ditches and a pit.

5.0 Aims and Objectives

- 5.1 The purpose of the excavation was to mitigate the effects of the proposed development upon the archaeological resource and to create a permanent record of the features and deposits exposed, in advance of development.
- 5.2 Evidence was gathered and recovered to gain as much information as necessary on the origins, form and function, date, development, phasing, spatial organisation, character, function, status, significance and the nature of social, economic and industrial activities on the site.
- 5.3 Research objectives were identified with reference to the *East Midlands Historic Environment Research Agenda* (<https://researchframeworks.org/emherf/>).
- 5.4 The framework identifies areas of interest and objectives that should be considered a focus of all excavations that take place within the East Midlands. This site had particular potential to assist in meeting research objectives for the medieval periods as indicated below.

Early Medieval

6.7.5: *To what extent did woodland regenerate in the post-Roman period and how were woodlands used and managed?*

High Medieval

7.1.1: *How did the major towns and smaller market towns of the region develop after the Norman Conquest, both within the urban core and in suburban and extra-mural areas?*

7.3.1: *How can the classification of moated and non-moated manorial sites be improved?*

7.7.3: *What can we deduce about changes in woodland management and animal or crop husbandry (including new crops, crop rotation, field systems, more intensive cultivation of clay soils and larger animals, particularly sheep)?*

6.0 Methodology

- 6.1 In order to mitigate the effect of the proposed development upon the archaeological resource, a programme of strip, map and record excavation was undertaken. The mitigation centred on an area around Trench 2 of the 2020 evaluation, where two possible field boundary ditches were uncovered (Williams 2022a) (Figure 2). An area of c.690m² was agreed and investigated (Figure 2).
- 6.2 Topsoil, subsoil and underlying non-archaeological deposits were removed by mechanical excavator with a toothless ditching bucket in spits no greater than 100mm in thickness. The

process was repeated until the first archaeologically significant or natural horizon was exposed. All further excavation was then by hand.

- 6.3 The excavation area was accurately located using a survey grade GPS receiving RTK corrections providing centimetre accuracy. Machine excavation was monitored at all times by an experienced field archaeologist.
- 6.4 A full written record of the archaeological deposits was made on standard AAL context recording sheets. Each deposit or layer was allocated a unique identifier (context number) consisting of three digits and accorded a written description, e.g. 001; a summary of these are included in Appendix 6. Numbers in square brackets represent cut features, e.g. ditch [041]
- 6.5 All excavated sections were drawn at a scale of 1:20. Photography formed an integral part of the recording strategy and all photographs incorporated scales and a directional arrow, as appropriate.
- 6.6 Fieldwork was undertaken over three days, from 20/06/2022 to the 22/06/2022 and was supervised by Richard Brennan.

7.0 Results (Figures 3, 4 and 5)

Geology

- 7.1 The geology for the site was a compact, mid-brown grey orange sand with small sub-rounded, poorly sorted, stone inclusions, 002.

Phase 1

- 7.2 On the eastern side of the excavation was northeast-southwest orientated ditch [039] (Plate 1). It had a gradual break of slope to a concave base. It was over 5m in length, 0.70m wide and 0.10m deep at its maximum. It contained a friable, mid grey sand silt with occasional small sub-rounded, poorly sorted, stone inclusions, 040. No finds were retrieved from this feature, although the distinct orientation likely suggests a separate phase of activity to the medieval activity (Phases 2 and 3).
- 7.3 At the southern limit of the excavation posthole [003] was truncated by pit [005](Phase 3) (Figure 4). It was in part revealed in plan, surviving as a sub-circular feature with a projected diameter of at least 0.45m. It had steep sides and a gradual break of slope to a concave base. Its fill, 004, was a firm grey sand silt with occasional small sub-rounded with poorly sorted stone inclusions. It survived up to 0.36m thick. No finds were recovered from this feature.



Plate 1: Ditch [039], looking southwest. Scale 1m

Phase 2

- 7.4 This phase consisted of a possible trackway defined by flanking ditches and an enclosure with internal features, all located in the southern half of the site.
- 7.5 A west-northwest to east-southeast orientated segmented boundary, ditch feature [016] and [041], defined the north side of the possible trackway. The ditch segments were c.5m long. At their widest they were 0.75m. The westerly slot revealed the boundary to be 0.15m deep. The boundary had a total length of over 15m. A soil sample from [016] produced charred cereal chaff, pulses and wild/weed plant seeds plant remains in high density. Potential pea seeds and vetch were also present. Some of the remains suggested that rough or waste ground was present. A radiocarbon age of 1166–1264 cal AD (UBA-49820; 95.4% probability) was obtained from *Triticum* free-threshing grain from the sample. The boundary was related to Feature 2 [019] of the evaluation.
- 7.6 Ditch Group 1 (Plate 1) ran parallel and c.4m to the south of [016]/[041]. This ditch, recorded in evaluation Trench 2, as terminal ditch Feature 4 [023], was c.20m long, had steep sides with a gradual break of slope to a concave base. It turned southwest for c.4m at its west-northwest end, enclosing an area of land to the southeast. This ditch contained a friable mid-brown grey sand silt with occasional small sub-rounded, poorly sorted, stone inclusions. No finds were recovered from this feature.
- 7.7 Adjacent to the western return of ditch Group 1 and cut by the boundary, was a short ditch segment [010], northeast to southwest orientated, with steep sides with a sharp break of slope to a flat base. Its fill was a friable mid brown grey sand silt with moderate small sub-rounded, poorly sorted, stone inclusions, 011 (Plate 1). No finds were recovered from this feature.



Plate 2: Ditch [010] (left) and Group 1 (right), looking northeast, Scales 0.10m and 0.50m

- 7.8 The ditch terminus of Group 1 suggested a possible entrance into the enclosed area to the south of Group 1, but there was no corresponding terminus to the south. Within the enclosed area were a number of pits. Pit [005] was almost 3m in length and continued beyond the limit of excavation. It was sub-circular and had moderately steep sides and a gradual break of slope to a concave base. It was filled with a friable, mid brown grey sand silt with occasional small sub-rounded, poorly sorted, stone inclusions, 006. Above this primary fill was a mid grey sand silt with occasional small sub-rounded, poorly sorted, stone inclusions, 007. No finds were recovered from this feature. Ovoid pit [033], 2.30m in length, 0.52m wide and 0.31m deep, lay to the northwest of [005]. It contained a single fill of friable, mid grey sand silt with small sub-rounded, poorly sorted stone, inclusions, 034, which contained a high density of wood charcoal fragments, possibly from oak branches or part of the trunk, and cereal grain, chaff and wild/weed plant seeds. A radiocarbon sample provided calibrated ages of 1164–1232 cal AD and 1240–1260 cal AD (UBA-49821; 95.4% probability). No finds were recovered from this feature.
- 7.9 Between these two pits were two intercutting pits [035] and [037], the latter was the earlier of the two. Pit [035] was also oval in plan. It measured 3.10m x 0.53m x 0.14m and contained a friable, mid grey sand silt with occasional small sub-rounded, poorly sorted, stone inclusions, 036. Pit [037] was smaller, 0.98m x 0.54m x 0.10m, and contained a similar fill, 038. No finds were recovered from this feature.
- 7.10 Large pit [031] extended from the southern edge of the site, immediately west of pit [035]. It had steep sides and a moderate break of slope to a concave base. Its single fill was a firm, dark grey sand silt with occasional small sub-rounded, poorly sorted, stone inclusions, 032. This pit was deemed to be of this phase because it contained four sherds of 11th to 13th century pottery from a single vessel, and high concentrations of charred plant remains, consisting of cereal grain, cereal chaff, pulses and wild/weed plant seeds and also vetch and possible pea seeds. It also had moderate to high concentrations of identifiable wood charcoal fragments from birch, alder and hazel. Additionally, broom, greenweed, rush and gorse were present. A radiocarbon sample provided a wide range of calibrated ages at 95.4% probability: 1037–1168, 1170–1175 and 1196–1198 cal AD (UBA-49822).



Plate 3: Pit [031], looking west-northwest. Scales 0.50m and 1m

Phase 3

- 7.11 A new boundary was noted for this phase, cutting the Phase 2 features. Ditch Group 2 (cuts ([008], [018], [022] and [024])), was north-northeast to south-southwest aligned with gradual sloping sides and a gradual break of slope to a concave base. This ditch ran the length of the excavation, was 1.15m wide and 0.44m deep. It was filled with a friable, mid grey sand silt with occasional small sub-rounded poorly sorted stone inclusions, 009, 019, 023 and 025. The samples from 009 had high densities of charred plant remains, specifically cereal grain, bread wheat, cereal chaff and pulses. Also, wild and weed plant seeds, some of which are associated with crops, as well as vetch and moderate to high concentrations of wood charcoal fragments from birch, alder and hazel, were present as well. A radiocarbon sample provided an age of 1037–1160 cal AD (95.45 probability; UBA-49815), although on this must not accurately reflect the age of the feature as on the basis of stratigraphic ground must date after the late-12th/early-13th century. No finds were recovered from this feature.



Plate 4: Ditch [24] / Group 2, looking north-northeast. Scales 0.10m and 0.50m

- 7.12 Ditch segment [026], immediately west of Group 2, was 4.70m long, 0.74m wide and 0.16m deep. It contained one fill, a friable, mid grey sand silt with occasional small sub-rounded, poorly sorted, stone inclusions, 027. From 027 came a low density of charred plant remains. No finds were recovered from this feature.

Phase 4

- 7.13 Overlying the southeast area of the site were successive deposits of made ground, 028, 029 and 030. Layer 030 was the earliest of these deposits. It was a 0.11m thick firm dark grey sand silt with occasional small sub-rounded, poorly sorted, stone inclusions. It sealed a compact, mid brown orange sand clay with occasional small, poorly sorted, sub-rounded stone inclusions, 029, 0.20m in thickness. The latest layer was 028, a compact, light brown grey sand gravel with small and medium sub-angular, moderately sorted, stone inclusions, 0.40m thick. No finds were recovered from this feature.



Plate 5: Made ground 028 - 030, looking southeast. Scales 0.50m and 1m

- 7.14 The topsoil, a firm dark grey sand silt with occasional small sub-rounded, poorly sorted, stone inclusions, 001, was up to 0.30m thick.

8.0 Discussion and Conclusions

- 8.1 The strip, map and record has recorded four phases of activity. Phase 2 produced the only relative dating evidence, pottery recovered from only one feature, with the remaining phases broadly pre- or post- dating this. A total of four radiocarbon samples from this phase and overlying Phase 3 provided further refinement of the chronology, helping to contextual the rich of environmental assemblage. The available dating evidence refines the age of the medieval deposits to the late 12th to early 13th century AD.

- 8.2 The orientation of ditch [039] in Phase 1 does not conform to the alignment of any boundary recorded on mapping post 1842, but Phases 2 and 3 do align with this mapping. This suggests that the Phase 1 ditch may predate the medieval and later established axis of organisation as observed in Phases 2 and 3. Posthole [003] must also predate the medieval activity based on the fact it is truncated by a Phase 2 ditch, but it provided no independent dating evidence. As Phase 1 is only represented by two features with an absence of finds, little can be deduced as to the nature of activity at the site in this phase.
- 8.3 Phase 2 is characterised by ditch Group 1 and ditches [016] and [041], which appeared to represent ditches flanking a trackway, with the segmented nature of the northern ditch possibly defining access points from the north. There was no evidence of an associated metallised surface. Ditch [016] provided a calibrated radiocarbon age of 1166–1264 cal AD (at 95.4% probability; UBA-49820) and a radiocarbon sample from Group 1 provided calibrated ages of 1164–1232 and 1240–1260 cal AD (at 95.4% probability; UBA-49821), confirming contemporaneity of the ditches and suggesting a late 12th to mid-13th century age.
- 8.4 The ditches appeared to mark the northeast extent of activity on the site during the late-12th to mid-13th century, with a series of pits to the southwest. A radiocarbon sample from pit [031] provided ages of 1037–1168, 1170–1175 and 1196–1198 cal AD (at 95.4% probability; UBA-49822), consistent with the pit being contemporaneous with the probable flanking ditches of the inferred trackway to the north. As such, the development area is likely at the periphery of the settlement focus, which would have likely continued to the southwest of the site.
- 8.5 The function of the pits is difficult to determine as little pottery was recovered and no other artefacts were present. However, a significant environmental assemblage was recovered (see Appendix 1). The high volume of charred material suggests that there was direct dumping of waste into features rather than the accumulation of wind-blown detritus. The composition of the charred plants indicates the use of crop processing by-products as fuel in crop drying kilns or ovens used for drying or parching cereal grain; the drying of grain in an oven or kiln prior to milling is necessary to facilitate grinding and grain may also be dried prior to storage to prevent spoilage (Fenton, 1978, p.375). Evidence for the use of crop processing by-products as fuel in crop drying ovens in the Roman period is widespread (van der Veen 1989) and evidence for the use of such products as fuel used for crop drying in the medieval period is increasing. For example, evidence for the use of free threshing wheat chaff as fuel has been found in a 12th–13th century oven or kiln at Grange Lane, Leicester (Monckton and Radini, 2010), 12th–13th century ovens at West Cotton, Raunds (Campbell and Robinson, 2010) and several medieval sites in Cambridge (Ballantyne and de Vareilles, 2019; Simmons, 2020).
- 8.6 The rich assemblages of wild/weed plant seeds that are associated with crop material in the charred plant assemblages also provide evidence for crop husbandry practices. The presence of seeds from typical crop weeds which are characteristic of heavy clay soils, soils with impeded drainage and nutrient rich soils, as well as seeds from crop weeds which are characteristic of lighter, free draining, acid soils and soils with low levels of fertility, suggest the cultivation of a range of different soil types. The abundance of grasses and leguminous taxa in the wild/weed seed assemblages may also point to the use of a crop rotation regime which included a period of fallow aimed at improving soil fertility (Carruthers and Hunter Dowse, 2019, p. 125).
- 8.7 In general, the charcoal assemblages are consistent with being derived from a mixed domestic hearth or oven fuel. The composition of these wood charcoal assemblages suggests that, although large caliber mature oak was available, domestic fuel likely consisted primarily of small caliber wood from a range of underwood trees/shrubs, scrub, hedgerow and wetland/riparian taxa. Potential evidence for the use of turf as fuel is also indicated small quantities of

root/tuber/rhizome and charred sclerotia from the soil dwelling fungus *Cenococcum*. The limited quantities of oak, one of the best quality fuel woods when it has been well seasoned, as it produces high combustion temperatures and a long duration of burning (Hoare, 2020; Porter, 1990), and has been considered indicative of the selection of fuel for use in craft kilns. However, the general diversity of taxa and lack of other evidence for industrial activity indicates opportunistic use of available fuel sources in a domestic setting.

- 8.8 Phase 3 was represented principally by Ditch Group 2. It must on stratigraphic grounds date after the late-12th to mid-13th century, but a radiocarbon sample from the ditch provided an anomalously earlier age of 1037–1160 cal AD (95.45 probability; UBA-49815). The radiocarbon sample may have been derived from an earlier deposit, both due to the potential mobility of the dated material (i.e., grain), but also the superposition of the parent deposit from which the sample was collected (009) with the fill of truncated pit [005].
- 8.9 Prior to the land's current use the site was levelled using a variety of brash and clay deposits. The alignment of the Phase 2 and 3 ditches is mimicked by the modern boundaries implying that although these particular features had gone out of use, the medieval land divisions identified on this site have been fossilised in the modern landscape.
- 8.10 The archaeological evidence recorded during this scheme of work indicates that it is likely that a domestic building was located close to this group of features as demonstrated by the rich environmental remains. The few other archaeological finds however would suggest that the site is on the edge or periphery of a domestic area. It is unlikely that the site is directly associated with the moated manor, located approximately 200m to the southeast, but may be associated through contemporaneous occupation or through fealty.

9.0 Acknowledgements

- 9.1 AAL would like to thank Startin Tractors for the commission.

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Appendix 1: The finds

Medieval Pottery

By Alice Forward

Introduction

Four joining sherds of pottery weighing 24g in total were recovered during excavations at Twycross.

Methodology

The assemblage has been recorded in line with the *Standard for Pottery Studies in Archaeology* (Barclay et al 2016) and with reference to the Leicester medieval pottery fabric series (Sawday 1999).

Results

Four sherds of from a single vessel, the base of a jar made in Potters Marston (PM) fabric, was recovered from context 032, the fill of pit [031]. The sherds are sooted on the external surface.

Context no.	No. sherds	Weight (g)	Fabric	Form	Date	Notes
032	4	24	Potters Marston	Jar	11 th – 13 th century	Sherds all joining and sooting on external surface

Table 1: Quantification of the pottery

Discussion

Four sherds from a single vessel were recovered from the fill of pit [031]. Potters Marston is one of the major pottery industries in Leicestershire in the medieval period, dating between the 11th to 13th centuries and therefore not unexpected in an assemblage from Twycross.

The sherds have been fully recorded and no further work is required.

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Environmental Samples

By Ellen Simmons

Introduction

Five bulk sediment samples were taken for the recovery of charred plant remains and wood charcoal during an archaeological program of strip, map and record on land at Startin Tractors, Ashby Road, Twycross, Leicestershire (NGR: SK 33679 05218) by Allen Archaeology in 2022. Samples from segmented boundary ditch feature [016], large pit [031], ovoid pit [033] and boundary ditch [008] produced moderate to high concentrations of well-preserved charred plant remains, including cereal grain, cereal chaff and wild/weed plant seeds, as well as high concentrations of wood charcoal which included roundwood. Radiocarbon dates obtained from cereal grains indicate that the charred material in all four of these features dates to the 11th -12th century and is likely to be broadly contemporary.

The recovery of high concentrations of cereal chaff and wild/weed plant seeds in medieval charred plant assemblages is relatively unusual and provides an opportunity to investigate crop processing and crop husbandry practices. The presence of high concentrations of wood charcoal, which is less frequently analysed than charred plant remains, provides an opportunity to investigate the availability and exploitation of local woodland and/or scrub.

Processing and assessment methodology

The samples were processed by Allen Archaeology using a water separation machine. Floating material was collected in a 300µm mesh and the remaining heavy residue retained in a 1mm mesh. A total of 130 litres of sediment was processed in this way. The samples were assessed (Simmons, 2022) in accordance with Historic England guidelines for environmental archaeology assessments (Campbell *et al.*, 2011) and the CIfA toolkit for specialist reporting (CIfA 2021). On the basis of this assessment, four of the samples were selected for further analysis of charred plant remains and wood charcoal. Samples were selected for analysis of charred plant remains where more than thirty quantifiable specimens of cereal grains and/or cereal chaff were present. Samples were selected for analysis of wood charcoal where more than one hundred >2mm charcoal fragments were present.

Charred plant remains analysis methodology

The results of the charred plant remains analysis are presented in Table 1. The charred plant remains in sample 5 from ditch [026] that were recorded during assessment are also included in Table 1. Prior to sorting, the samples were separated into size fractions of >2mm, 1-2mm, 0.5-1mm and 0.3-0.5mm using a stack of sieves. One very large sample (sample 2 from ditch [017]) was split using a riffle box and 25% was sorted for grain and chaff (the whole sample being sorted for wild/weed plant seeds and other charred remains). The resulting counts of grain and chaff were then multiplied by 4 to provide an estimate of the counts for the whole sample. These figures are marked with an asterisk in the Table 1.

The samples were sorted and charred plant macrofossils examined using a stereo-binocular microscope (x10 – x80). Identifications of plant material were carried out by comparison with material in the reference collections at the Department of Archaeology, University of Sheffield and various reference works (e.g. Cappers *et al.*, 2006, Jacomet, 2006). Cereal identifications and nomenclature follow Zohary *et al.* (2012). Other plant nomenclature follows Stace (2019). Quantification of cereal grains was based on the presence of embryo ends and quantification of chaff was by glume base or rachis node and the nodes of straw (G Jones, 1990). The seed, in the broadest sense, of the plant is always referred to in Table 1 and all material referred to in Table 1 is charred, unless stated otherwise.

The abbreviation *cf.* means 'compares with' and denotes that a specimen most closely resembles that taxon more than any other.

Wood charcoal analysis methodology

The results of the wood charcoal analysis are summarised in Table 3, and the full charcoal fragment recording tables are included in the Appendix. Assessment indicated the potential for a high diversity of taxa in sample 1 from ditch [008], sample 2 from ditch [017] and sample 4 from pit [031] and so one hundred >2mm charcoal fragments were randomly selected for identification from each of these samples to provide representative evidence of wood fuel use. As sample 3 from pit [033] was apparently composed largely of oak, the identification of fifty >2mm charcoal fragments was deemed sufficient to characterise the charcoal assemblage in this sample.

Wood charcoal was examined using a stereo-binocular reflected light (episcopic) microscope (x 50, x 100 and x 400 magnification), and identifications were made based on the anatomic features observed in transverse, radial and tangential planes. Identification of wood charcoal was carried out by comparison with the reference collections at the Department of Archaeology, University of Sheffield and various reference works (e.g. Hather, 2000; Schweingrüber, 1990).

The total number of fragments of each species is shown in Table 3 along with the total number of fragments from each species which exhibited certain dendrological features (*cf.* Marguerie and Hunot, 2007). Where at least three growth rings are present, ring curvature is designated as weak, intermediate or strong, indicating larger branches and trunk material, intermediate sized branches or smaller branches and twigs. Narrow growth rings are recorded on charcoal fragments with weak ring curvature where growth ring width is consistently less than 1mm, which corresponds to slow growth. Wide growth rings are recorded for charcoal fragments with weak ring curvature where growth ring width is consistently greater than 3mm, which corresponds to fast growth. The presence of thick walled tyloses in most vessel cavities (indicating the presence of heartwood and therefore mature trunk wood), the presence of reaction wood in the vessel cavities (indicating the use of branch wood), the presence of fungal hyphae and insect degradation (indicating the use of dead or rotting wood), and the presence of bark and pith were also recorded. The degree of vitrification of the charcoal fragments was recorded as a measure of preservation, with levels of vitrification classified as either low brilliance refractiveness (degree 1), strong brilliance (degree 2) or total fusion (degree 3).

Charred plant remains results

Preservation

Preservation of charred plant macrofossils in all four samples was relatively good. Although a moderate proportion of the cereal grains were puffed and distorted or 'clinkered' most of the cereal grain exhibited minimal distortion and epidermis was often retained. Cereal chaff, which is more easily destroyed by charring than cereal grain (Boardman and Jones, 1990), was also present in all four analysed samples. The high density (Table 1) and good preservation of the charred material in ditch [016], pit [031] and ditch [008] suggests rapid deposition and limited reworking of the deposits.

Cereals and other food plants

The most frequently occurring cereal grain type in the samples was free threshing wheat (*Triticum* free threshing), identified by rounded grains with a deep ventral groove. Free threshing wheat chaff was also present in all four analysed samples, and where identification to species was possible, this was of the hexaploid bread-type wheat (*Triticum aestivum* L. type), identified by curving sides and cleanly broken glume parts. It is therefore likely that all the free threshing wheat grains in the samples are bread-type wheat. A small number of grains with an elongated shape, parallel sides and a flat ventral surface were identified as spelt wheat (*Triticum spelta* L.) and the presence of a diagnostic

spikelet fork of spelt wheat in sample 2 from boundary ditch [017] provides confirmation that spelt wheat was present, albeit as a low proportion of the crop assemblages. Other free threshing cereals which comprise moderate proportions of the crop assemblages are rye (*Secale cereale* L.) and barley (*Hordeum vulgare/distichon* L.). No 'twisted' grains of barley (characteristic of the lateral spikelets of 'six-row' barley) were identified and no diagnostic barley rachis was present, so it was not possible to determine whether the barley grain is of the 'two-row' or 'six-row' form. Oat is also present and two tentatively identified floret bases of cultivated oat (*Avena strigosa* Schreb/*Avena sativa* L.) were found. Oat was widely cultivated as a crop in the medieval period (Carruthers and Hunter-Dowse, 2019, pp. 202-203; McKerracher, 2019) and it is therefore considered likely that the oat grain in the samples are from cereals rather than crop weeds, although it is possible that some of the oat grain in the samples is wild oat.

Small quantities of large-seeded legumes are present in the samples, some of which are likely to be cultivars. Garden pea (*Pisum sativum* L.) and common vetch (*Vicia sativa* ssp. *sativa* L.) were both identifiable due to preservation of the diagnostic hilum. The presence of only small quantities of cultivated legumes in archaeobotanical samples is common, as these crops do not require parching during processing, so are much less likely to be preserved by charring than cereal grain (Treasure and Church, 2017). The presence of even small quantities of legumes in the samples therefore suggests that cultivated legumes were an important crop. The presence of a seed of flax (*Linum usitatissimum* L.) points to the cultivation of flax as a fibre or oil crop.

Wild/weed plants

Many of the charred wild/weed plant seeds that are present in the samples are from typical crop weeds or plants of fertile disturbed soils and are found in association with rich assemblages of charred crop material. It is therefore likely that most of these seeds were harvested with the crops and brought to the site from arable fields. However, it is also possible that the charred wild/weed seed assemblages may include seed derived from plants growing in disturbed nutrient rich soils around areas of occupation. Some of the wild/weed plant seeds may also be from sources other than arable fields and may have been brought to the site for use as thatch, strewing materials bedding, turves, fuel or fodder.

One of the most frequently occurring species in the wild/weed seed assemblages is stinking chamomile (*Anthemis cotula* L.) which is a typical medieval arable weed associated with heavy clay soils and clay loam soils (Kay, 1971). The increasing frequency of this weed in charred plant remains assemblages has been interpreted as an indicator of the expansion of agriculture onto heavy soils, facilitated by improvements in plough technology, and in particular the mouldboard plough (M Jones, 2009). Other species which are present in the samples, such as wild radish (*Raphanus raphanistrum* ssp. *raphanistrum* L.), corn spurrey (*Spergula arvensis* L.) and cornflower (*Centaurea cyanus* L.) are also typical crop weeds, but are associated with more free draining, slightly acidic soils. A further group of crop weeds which are present in the samples are those associated with nutrient rich soils, including scentless mayweed (*Tripleurospermum inodorum* (L.) Sch. Bip.), chickweed (*Stellaria media* (L.) Vill.), fat hen (*Chenopodium album* L.) and orache (*Atriplex* spp.). Corncockle (*Agrostemma githago* L.) and black bindweed (*Fallopia convolvulus* (L.) Á. Löve) are typical crop weeds that are tolerant of various soil types. Several of the species in the wild/weed seed assemblages are associated with a range of waste and rough ground habitats as well as arable fields including curled/clustered/broad-leaved dock (*Rumex crispus/conglomeratus/obtusifolius*), nipplewort (*Lapsana communis* ssp. *communis* L.), knotgrass (*Polygonum aviculare* agg.) redshank/pale persicaria (*Persicaria maculosa/lapathifolia*) and greater plantain (*Plantago major* L.).

A group of frequently occurring taxa include large and small seeded grasses (Poaceae) and vetches/vetchlings (*Vicia/Lathyrus* spp.) which are typically associated with grassland habitats. Leguminous taxa are also associated with soils with low levels of fertility, due to root nodules containing bacteria which can fix nitrogen from the atmosphere, which gives these plants an adaptive

advantage over other species on such soils. Other species which are commonly associated with grassy habitats include buttercup (*Ranunculus acris/repens/bulbosus*), agrimony (*Agrimonia eupatoria* L.), eyebright/red bartsia (*Euphrasia/Odontites vernus* (Bellardi) Dumort.), ribwort plantain (*Plantago lanceolata* L.) and sheep's sorrel (*Rumex acetosella* L.). Sheep's sorrel is also associated with acidic, sandy soils and heaths. Sedges (*Carex* spp.) are also occasionally present in the samples, most of the species of which are typically associated with damp soils. Seeds of other species which are associated with damp soils include rushes (*Juncus* spp.) and spike-rush (*Eleocharis* sp.) as well as the grassland species eyebright/red bartsia and the waste ground species redshank/pale persicaria.

Table 1 – Quantification of charred plant remains

Cut number			016	033	031	008	026
Context number			017	034	032	009	027
Sample number			002	003	004	001	005
Sample volume (litres)			26	27	25	25	27
Volume of modern rootlets (ml)			40	20	20	20	10
Flot volume excluding modern rootlets (ml)			110	40	30	90	5
Latin binomial	Common name	Weed code					
Cereal grain							
<i>Avena</i> sp.	oat		38	4	18	5	1
cf. <i>Avena</i> sp.			40		17	16	
<i>Hordeum vulgare/distichum</i> symmetrical (hulled)	hulled barley		3		1		
<i>Hordeum vulgare/distichum</i> (hulled)			1		2	19	
<i>Hordeum vulgare/distichum</i>	barley			1	1	21	
<i>Hordeum vulgare/distichum</i> tail grain						2	
cf. <i>Hordeum vulgare/distichum</i>						4	
cf. <i>Hordeum vulgare/distichum</i> tail grain						4	
<i>Secale cereale</i> L.	rye		20	1	22	4	1
cf. <i>Secale cereale</i> L.			9	1	11	2	
<i>Triticum spelta</i> L.	spelt wheat		6	1			
<i>Triticum</i> cf. <i>spelta</i> L.			10	1	3		
<i>Triticum</i> free threshing	free threshing wheat		548*	10	87	89	
<i>Triticum</i> cf. free threshing			324*	12	75	72	2
<i>Triticum</i> free threshing tail grain	free threshing wheat		40*		7		
<i>Triticum</i> sp.	wheat		164*	4	98	67	
<i>Triticum</i> sp. tail grain			64*			7	
Cereal indet.					14	10	
Cereal chaff							
<i>Avena</i> cf. <i>strigosa</i> Schreb/ <i>Avena sativa</i> L. floret base	bristle oat/oat		2				
<i>Secale cereale</i> L. rachis internode	rye		137		3		
<i>Triticum spelta</i> L. glume base	spelt wheat		2				
<i>Triticum aestivum</i> L. rachis internode	bread wheat		256*		4	7	
<i>Triticum</i> cf. <i>aestivum</i> L. rachis internode			928*	5	28	38	
<i>Triticum</i> free threshing rachis internode	free threshing wheat		336*	6	10	24	
<i>Triticum</i> free threshing basal rachis internode			56*		2	3	
Awn fragments (twisted)			6				
>2mm culm node			48		7	5	
Other plant remains of potential economic value							
<i>Vicia sativa</i> ssp. <i>sativa</i> L.	common vetch		3				
<i>Pisum sativum</i> L.	garden pea		1				
>2mm <i>Vicia/Lathyrus/Pisum</i>	large-seeded vetch/vetchling/pea				13		
>2mm large legume fragment			1.5		1		
<i>Linum usitatissimum</i> L.	flax					1	
Wild/weed plant seeds							
<i>Ranunculus acris/repens/bulbosus</i>	meadow/creeping/bulbous buttercup	BFH			1	4	
<i>Vicia/Lathyrus</i> spp. (<2mm)	small-seeded vetch/vetchling	BFH	133	12	151	29	
<i>Vicia/Lathyrus</i> spp. (>2mm)	large-seeded vetch/vetchling	BFH	21	1.5		1	
<i>Vicia hirsuta</i> (L.) Gray	hairy tare	BFH	8		8	5	
<i>Vicia tetrasperma</i> (L.) Schreb.	smooth tare	BFH	6		4		

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Volume of modern rootlets (ml)			40	20	20	20	10
Flot volume excluding modern rootlets (ml)			110	40	30	90	5
Latin binomial	Common name	Weed code					
<i>Potentilla</i> L. type	cinquefoils	SFH			1		
<i>Agrimonia eupatoria</i> L.	agrimony	SHH	10		3	2	
<i>Raphanus raphanistrum</i> ssp. <i>raphanistrum</i> L. seed pod	wild radish	BHH	3				
<i>Persicaria maculosa/lapathifolia</i>	redshank/ pale persicaria	SFH	3			19	
<i>Polygonum aviculare</i> agg.	knotgrass	SFH			1	1	
<i>Fallopia convolvulus</i> (L.) Á. Löve	black bindweed	BFH			1		
<i>Rumex acetosella</i> L.	sheep's sorrel	SFH	2				
<i>Rumex crispus/conglomeratus/obtusifolius</i>	curled/clustered/ broad-leaved dock	SFH	21		3	11	
<i>Rumex</i> sp.	dock	SFH				1	
<i>Stellaria</i> sp.	stitchwort	SFH	2				
<i>Stellaria media</i> (L.) Vill.	common chickweed	SFH			1	4	
<i>Cerastium</i> sp. L.	mouse ear					2	
<i>Spergula arvensis</i> L.	corn spurrey	SFH			2		
<i>Agrostemma githago</i> L.	corncockle	BFH			2	1	
<i>Silene flos-cuculi</i> (L.) Clairv.	ragged-robin	SHH				1	
<i>Chenopodium album</i> L.	fat hen	SFH		1	2	1	
<i>Atriplex patula/prostrata</i>	common/spear leaved orache	SFH	4		5		
<i>Anagallis arvensis</i> ssp. <i>arvensis</i> L.	scarlet pimpernell	SHH			1		
<i>Anagallis</i> sp. L.	pimpernell	SHH	1				
<i>Veronica</i> sp. L.	speedwell	SFH				1	
<i>Plantago major</i> ssp. <i>major</i> L.	greater plantain	SFH			2		
<i>Plantago lanceolata</i> L.	ribwort plantain	SHH				1	
<i>Lamium album/purpureum</i> L.	white/red dead nettle	SFH	3				
<i>Galeopsis</i> sp. L.	hemp nettle	BFH	3				
<i>Mentha arvensis</i> L.	corn mint	SFH	1			1	
<i>Euphrasia/Odontites vernus</i> (Bellardi Dumort.)	eyebright/red bartsia	SFL	1		6		
Asteraceae	Daisy family				1		
<i>Centaurea cyanus</i> L.	cornflower	BHH	4		6	2	
<i>Lapsana communis</i> ssp. <i>communis</i> L.	nipplewort	SFL	1		1		
<i>Anthemis cotula</i> L.	stinking chamomile	BHH	121	1	92	187	1
<i>Tripleurospermum inodorum</i> (L.) Sch. Bip.	scentless mayweed	SFL	79	2	43	10	
<i>Valerianella dentata</i> (L.) Pollich	cornsalad	SFH				2	
<i>Juncus</i> spp.	rush	SFL				3	
<i>Juncus</i> spp. seed head		SHH				1	
<i>Eleocharis</i> sp.	spike rush	SFH			1	1	
<i>Carex</i> spp. (ovoid)	sedges	SFH			2	2	
<i>Carex</i> spp. (trigonous)	sedges	SFH			1		
<i>Festuca</i> sp.	fescue	SFH				1	
cf. <i>Bromus</i> sp.		BFH	6	1			
<i>Poa</i> spp.	meadow grass	SFH	14		16		
Poaceae >2mm	large-seeded grasses	BFH	107	5	32	23	2
Poaceae <2mm	small-seeded grasses	SFH	14		6	12	
Unidentified seed			5		4	13	
Total quantifiable charred plant specimens			3587	67.5	806	741	7
Density of quantifiable charred items per litre of sediment			138.0	2.5	32.2	29.6	0.3

Cut number			016	033	031	008	026
Context number			017	034	032	009	027
Sample number			002	003	004	001	005
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Volume of modern rootlets (ml)			40	20	20	20	10
Flot volume excluding modern rootlets (ml)			110	40	30	90	5
Latin binomial	Common name	Weed code					
Other charred plant remains							
<2mm culm node/monocot stem fragment			28		14	10	1
root/tuber/rhizome			10	1	6	2	2
moss stem					2		
thorn			1				
leaf bud						1	
<i>cf. Calluna vulgaris</i> (L.) Hull	heather (stem)		+	+	+		+
>2mm wood charcoal			++++	+++++	++++	+++++	+++
<i>Cenococcum sclerotia</i>				+++++			

* = estimated figures (25% of sample sorted and counts multiplied by 4)

Semi-quantified remains: - = < 10 items, + = 10-29 items, ++ = 30-49 items, +++ = 50-99 items, ++++ = 100-499 items, +++++ = > 500 items

Weed/wild seed categories: SFL = small free light; BHH = big headed heavy; SFH = small free heavy; BFH = big free heavy; O = other wild/weed seed; Uncl = unclassified (following Jones, 1984: Table 2; Van der Veen, 1992: Table 7.4; McKerracher, 2019: Metadata 4).

Sample composition

In order to identify the presence of different crop processing products and by-products in the samples, the relative proportions of grain and chaff of the different crop types, and the proportions of total grain, total chaff and wild/weed plant seeds were calculated (Table 2) and plotted on bar graphs (Figures 1-2). Spelt wheat was excluded from the calculations of the proportions of grain and chaff, as the chaff of glume wheat is removed at a different stage in the processing sequence than the chaff of free threshing cereals. Indeterminate wheat grain and cereal grain was however included in the calculations, as most of the indeterminate wheat grains are considered likely to be bread wheat and the indeterminate cereal grains are likely to be free threshing cereals.

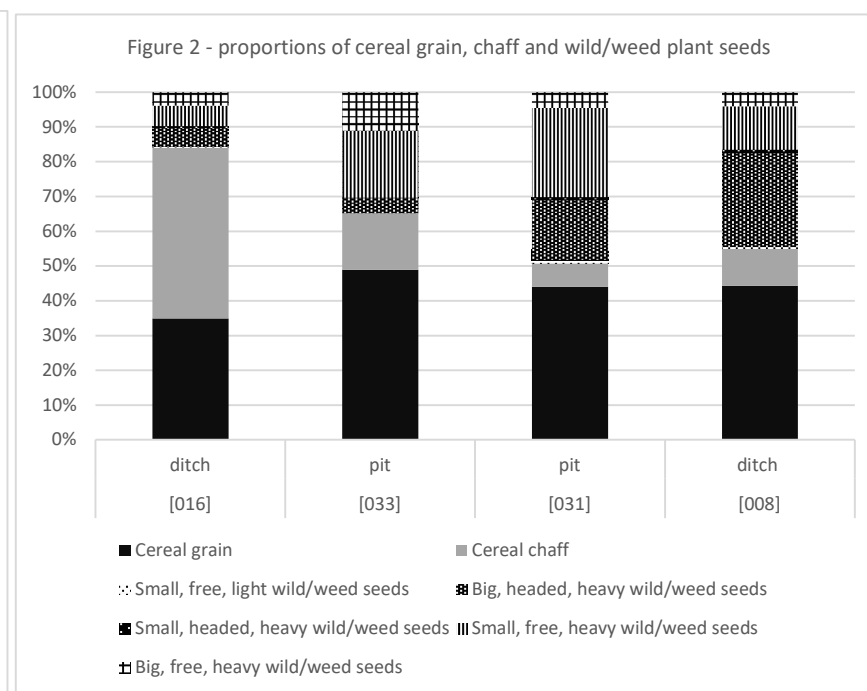
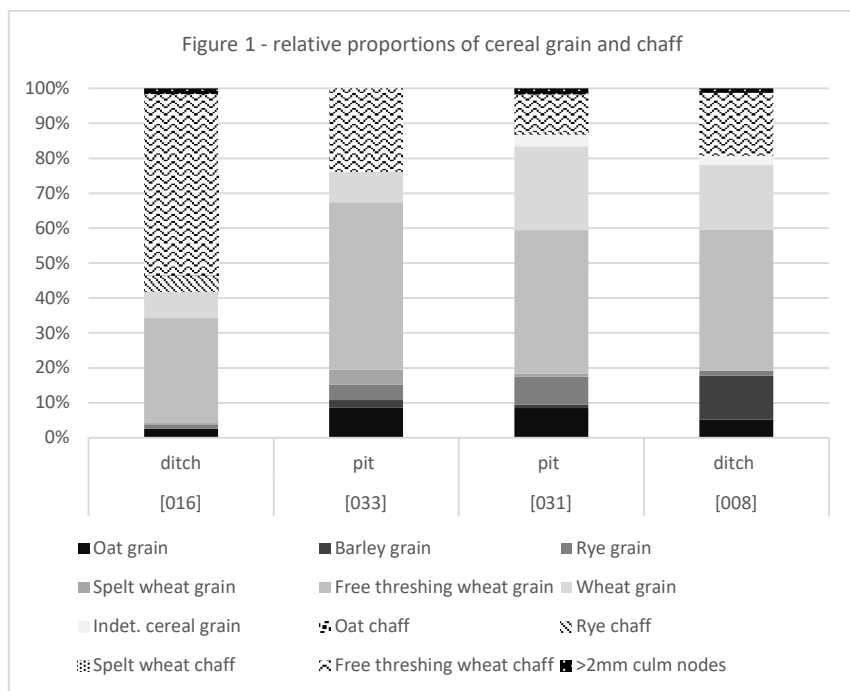
The physical characteristics of wild/weed plant seeds can be used to identify the presence of products and by-products from different stages of crop processing (G Jones, 1984) so the wild/weed seed category has been separated into small, free, light seeds, big, headed, heavy seeds, small, headed, heavy seeds, small, free, heavy seeds and big, free, heavy seeds (following G Jones, 1984: Table 2; van der Veen 1992: Table 7.4; McKerracher, 2019, Metadata 4). Most of the wild/weed seeds fell into one of these five categories. For the purposes of plotting the data on these graphs, tentative identifications of crop types and wild/weed seed taxa were amalgamated with the more definite identifications.

The charred plant assemblages from pit [033], pit [031] and ditch [008] are composed of a high proportion of cereal grain in comparison to chaff and a high proportion of wild/weed plant seeds in comparison to grain and chaff. The wild/weed seed assemblages are composed primarily of big, headed, heavy seeds and small, free, heavy seeds along with some big, free, heavy seeds. The high proportion of cereal grain in these samples may suggest the accidental charring of clean grain during the final stages of processing (such as drying or food preparation). The presence of large heavy wild/weed seeds in these samples, along with high proportions of cereal grain, suggests that some by-products from hand sorting are likely to be present, or grain-sized weeds that were charred accidentally along with the cereal grain. However, the high proportions of small, free, light, and big, headed, heavy seeds, and the presence of a somewhat greater proportion of free threshing wheat chaff than may be expected if only fine sieved products were present (G Jones 1990, p. 93-96), suggests the mixing of by-products from earlier crop processing stages (such as coarse and fine sieving) with the accidentally charred grain. Alternatively, this type of composition could result from the accidental charring of whole sheaves. However, a greater proportion of chaff including awns and a greater proportion of small, free, light wild/weed seeds may be expected if whole sheaves were accidentally charred, although the low proportion of chaff may be due to differential preservation, as chaff is less likely to survive charring than cereal grain (Boardman and Jones, 1990).

The charred plant assemblage from ditch [016] has a contrasting composition which consists of a high proportion of chaff in comparison to grain, and a small proportion of wild/weed plant seeds in comparison to grain and chaff. The wild/weed seed assemblage is composed of roughly equal proportions of big, free, heavy seeds, small, free, heavy seeds, and big, headed, heavy seeds. This type of composition is consistent with a coarse sieve by-product, possibly mixed with a small proportion of accidentally charred grain, grain sized weed seeds and some by-products from fine sieving.

Table 2. Relative proportions of different classes of charred plant material in fully analysed samples

Cut number	017	033	031	008
Context number	016	034	032	009
Sample number	002	003	004	001
Phase	2	2	2	3
Date	cal AD 1166-1264	cal AD 1164-1260	cal AD 1037-1198	cal AD 1037-1160
Context description	fill of segmented boundary ditch	fill of pit	fill of pit	fill of ditch
% free threshing grain	34.9	48.9	43.8	43.5
% rachis and culm	49.1	16.3	6.7	10.4
% wild/weed seed	16.0	34.8	49.5	46.2
% small, free, light (SFL) wild/weed seed (winnowing by-product)	0.1	0	0.9	0.4
% big, headed, heavy (BHH) wild/weed seed (coarse sieve by-product)	5.8	4.4	17.5	26.9
% small, headed, heavy (SHH) wild/weed seed (coarse sieve by-product)	0.3	0	0.5	0.7
small, free, heavy (SFH) wild/weed seed (fine sieve by-product)	5.9	19.3	25.6	12.3
% big, free, heavy (BFH) wild/weed seed (fine sieve product)	3.8	11.1	4.5	3.9



Wood charcoal

Preservation

Wood charcoal from ditch [016], pit [031] and ditch [008] was well preserved, with a low incidence of vitrification, whereby charcoal takes on a glassy appearance which can hamper identification or the recording of dendrological features. Charcoal fragments greater than 4mm in size were also present in pit [031] and ditch [008] which allowed a determination of the ring curvature of many of the fragments. The presence of large charcoal fragments in pit [031] and ditch [008] is consistent with the evidence from the charred plant remains assemblages which suggests that the charred material in these features had not been significantly reworked.

Wood charcoal from pit [033] was somewhat poorly preserved. Most of the fragments had been affected by vitrification and silt particles were present in the vessel cavities of all the fragments. Although this did not significantly hamper identification (most of the assemblage was composed of oak which is easily identifiable) it is likely that dendrological features such as the presence of tyloses and fungal hyphae will have been under recorded in this assemblage.

Woody plant taxa

The taxa identified in the four analysed samples are pear/apple/service/rowan/whitebeam/hawthorn (Maloideae), bird/wild cherry (*Prunus cf. avium/padus*), cherry plum/blackthorn/plum/damson (*Prunus cf. cerasifera/spinosa/domestica* spp. *domestica/domestica* spp. *insititia*), alder buckthorn (*Frangula alnus* Mill), beech (*Fagus sylvatica* L.), oak (*Quercus* sp.), birch (*Betula* sp.), alder (*Alnus glutinosa* L. Gaertn.), hazel (*Corylus avellana* L.), poplar/willow (*Populus/Salix* sp.), field maple (*Acer campestre* L.), heather (*Calluna vulgaris* (L.) Hull), ash (*Fraxinus excelsior* L.), holly (*Ilex aquifolium* L.) and elder (*Sambucus nigra/ebulus*).

It is often not possible to identify charcoal beyond a certain taxonomic level due to the similarities between related species/genera, so wood charcoal was identified to as high a taxonomic level as possible. For example, bird/wild cherry (*Prunus avium/padus*) is difficult to differentiate from cherry plum/blackthorn/plum/damson (*Prunus cf. cerasifera/spinosa/domestica* spp. *domestica/domestica* spp. *insititia*), so tentative identification of bird/wild cherry is based on whether rays were often or predominantly less than five cells wide and cherry plum/blackthorn/plum/damson on whether rays were often or predominantly more than five cells wide. Maloideae is a large sub-family of Rosaceae (rose family) containing many species which cannot be differentiated, although the native species which are likely to be present are wild pear (*Pyrus communis*), crab apple (*Malus sylvestris*), service tree (*Sorbus domestica*), rowan (*Sorbus aucuparia*), whitebeam (*Sorbus aria* agg./*Sorbus intermedia* agg./*Sorbus latifolia* agg.) or hawthorn (*Crataegus monogyna/laevigata*). For the sake of brevity, charcoal with this identification will be referred to as Maloideae.

Sample composition

The relative proportions of the woody taxa present in each sample were plotted on a bar graph (Figure 3). As fragmentation rates can differ between taxa and are influenced by many factors (Chrzaszcz *et al.*, 2014), small differences in the proportions of the taxa present are unlikely to be directly related to the quantity of wood from each species that was used as fuel. However, where a large proportion of one taxon and a low diversity of other taxa is present, this is likely to indicate the preferential selection of fuel wood.

The charcoal assemblages from ditch [016] and pit [031] are characterised by a particularly high diversity of taxa. Oak is present in both assemblages and ring curvatures of the oak charcoal fragments are often weak, indicating the use of larger branches or trunk material. Tyloses are also present in the vessel cavities of many of the oak charcoal fragments, indicating the use of mature heartwood. Some

oak with strong ring curvature is, however, also present, indicating the use of smaller branches or twigs. Charcoal of other woodland trees, consisting of beech and ash, is also present but these taxa comprise very small proportions of the assemblages from these features.

Most of the other taxa which are present, such as hazel, birch, holly, all the potential Maloideae species, bird/wild cherry and elder are typical trees or shrubs of underwood, hedgerows and scrub. Ring curvatures of the charcoal fragments from these species are frequently strong or intermediate, which suggests the use of smaller branches and twigs. The presence of alder buckthorn, which is a shrub associated with bogs or open woods on peaty soils, and alder, which is associated with riverbanks, lakesides, fens and bogs (and potentially willow which is associated with similar habitats to alder) also suggests some collection of wood from habitats with damp soils. The presence of heather suggests the exploitation of heath. The composition of the charcoal assemblages from ditch [016] and pit [031] therefore suggests the collection of primarily small diameter branches and twigs from a diverse range of underwood, hedgerow, scrub, heath, and riparian/wetland habitats

The charcoal assemblage from ditch [008] is also characterised by a relatively high diversity of taxa including a range of underwood, hedgerow and scrub species. However, a high proportion of the assemblage is composed of hazel roundwood which suggests some degree of preferential selection of hazel roundwood as fuel. Unfortunately, most of the hazel roundwood charcoal was somewhat fragmented so it was not possible to count the number of rings to determine whether the hazel branches were cut at similar ages or to examine the growth ring widths for evidence of woodland management. The predominance of hazel roundwood in this assemblage does however suggest the potential presence of coppiced hazel from managed woodland.

The charcoal assemblage from pit [033] is characterised by a low diversity of taxa with a predominance of oak. Most the oak charcoal fragments from pit [033] have weak ring curvature and tyloses in the vessel cavities, which suggests the preferential selection of heartwood from mature oak as fuel.

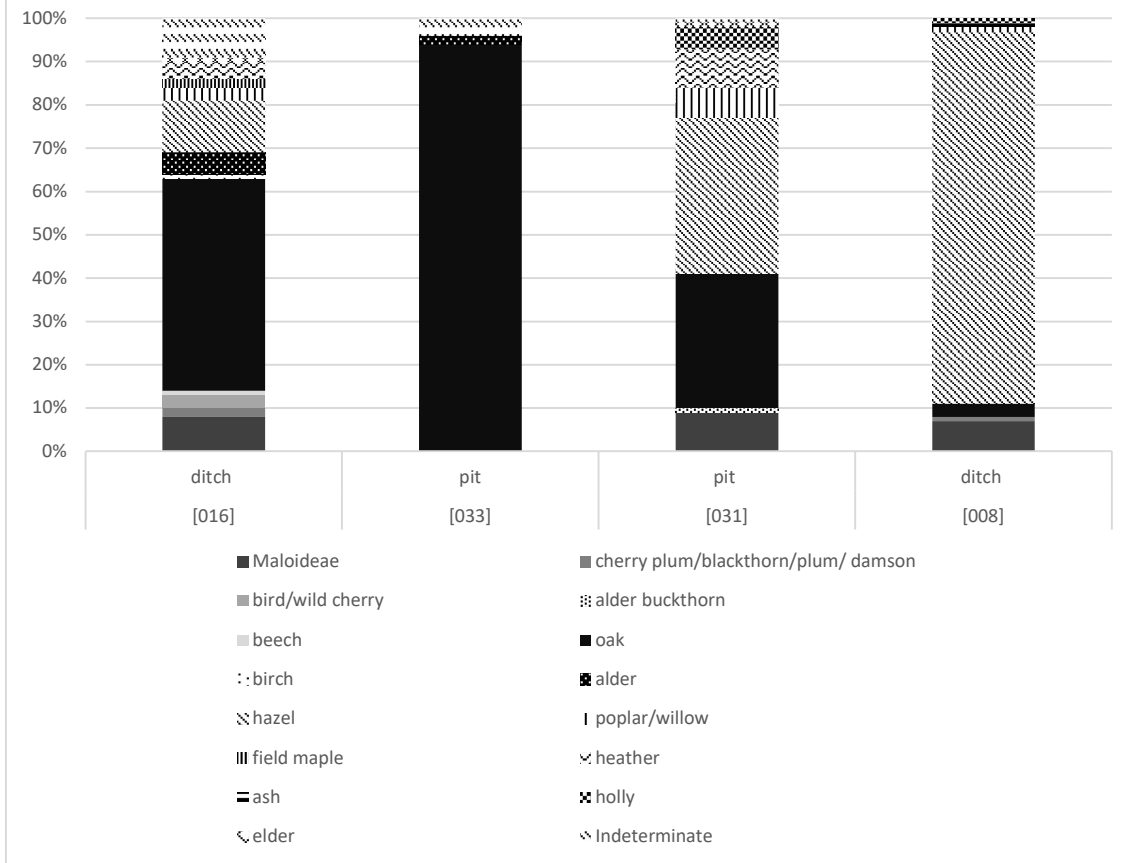
Table 3. Summary of charcoal assemblage composition.

Cut number		033	016	031	008
Context number		034	015	032	009
Sample number		003	002	004	001
Phase		2	2	2	3
Date		cal AD 1164- 1260	cal AD 1166-1264	cal AD 1037- 1198	cal AD 1037- 1160
Context description		fill of pit	fill of segmented boundary ditch	fill of pit	fill of ditch
Latin binomial	Common name				
Maloideae	apple/pear/rowan/ whitebeam/ hawthorn		8 (vit 1)	9	7 (wk 1, int 2, st 2, fung 1)
<i>Prunus</i> cf. <i>cerasifera/spinosa/domestica</i> spp. <i>domestica/domestica</i> spp. <i>insititia</i>	cherry plum/blackthorn/plum/damson		2 (vit 1)		1 (fung 1)
<i>Prunus</i> cf. <i>avium/padus</i>	bird/wild cherry		3 (int 1)		
<i>Frangula alnus</i> Mill	alder buckthorn			1 (st 1)	
<i>Fagus sylvatica</i> L.	beech		1		

Cut number		033	016	031	008
Context number		034	015	032	009
Sample number		003	002	004	001
Phase		2	2	2	3
Date		cal AD 1164- 1260	cal AD 1166-1264	cal AD 1037- 1198	cal AD 1037- 1160
Context description		fill of pit	fill of segmented boundary ditch	fill of pit	fill of ditch
Latin binomial	Common name				
<i>Quercus</i> sp.	oak	47 (wk 11, nr 2, ty 23, vit 35)	49 (st 3, wk 10, nr 4, ty 26, vit 1)	31 (st 2, wk 12, nr 12, pith 1, ty 20, vit 4)	3 (st 2, fung 1, pith 1, ty 1)
<i>Betula</i> sp.	birch		1 (fung 1)		
<i>Alnus glutinosa</i> (L.) Gaertn.	alder	1	5		
<i>Corylus avellana</i> L.	hazel		12 (st 2, fung 3, pith 1)	36 (st 17, fung 2)	86 (st 60, fung 8, pith 5, bark 1, vit 2)
<i>Populus/Salix</i> sp.	poplar/willow		3 (st 2)	7 (bark 1)	1
<i>Acer campestre</i> L.	field maple		2		
<i>Calluna vulgaris</i> (L.) Hull	heather		4 (st 4, pith 1, bark 1)	9 (st 8, pith 4, bark 4, vit 1)	
<i>Fraxinus excelsior</i> L.	ash				1
<i>Ilex aquifolium</i> L.	holly			5 (st 2)	1
<i>Sambucus nigra/ebulus</i>	elder		1	1	
Indeterminate		2 (vit 1)	9 (vit 2)	1 (st 1, fung 1)	
Total number of fragments identified		50	100	100	100

st = strong ring curvature, int = intermediate ring curvature, wk = weak ring curvature, nr = narrow rings (<1mm), wide rings (wr), fung = fungal hyphae, insect = insect degradation, pith = pith present, bark = bark present, ty = tyloses, re = reaction wood, vit = vitrified.

Figure 3: charcoal assemblage composition by fragment frequency



Discussion

The presence of a diverse range of cereal, pulse and fibre/oil crops in the samples from Twycross is typical of medieval charred plant remains assemblages. Free threshing wheat, rye, hulled barley and oats are the principle cereal crops which became established in the Saxon period and continued to be cultivated in the medieval period (Carruthers and Hunter-Dowse, 2019, p.125). Spelt is occasionally present in medieval charred plant remains assemblages, although generally in low concentrations and therefore likely to be a contaminant of other crops. Flax was also an important crop in the medieval period, which was grown for fibre and oil, but is likely to be under-represented in charred plant remains assemblages due to poor preservation of the seeds by charring (Carruthers and Hunter-Dowse, 2019, p.125). Documentary and archaeobotanical evidence indicate that legumes such as peas and beans also became an important component of agricultural produce during the medieval period (Carruthers and Hunter Dowse 2019, p.125). Legumes may have been grown as mixed crops with cereals or utilised as part of a crop rotation regime (Carruthers and Hunter Dowse, 2019, p.125). Vetches are likely to have been cultivated as fodder rather than for human consumption (Moffett, 2006, p.53).

The composition of the charred plant assemblages from pit [033], pit [031] and ditch [008] suggest that accidentally charred grain and some grain sized wild/weed plant seeds from the later stages of free threshing cereal processing are mixed with some coarse sieve and fine sieve by-products. This evidence may point to the use of crop processing by-products as fuel in crop drying kilns or ovens used for drying or parching cereal grain. The drying of grain in an oven or kiln prior to milling is necessary to facilitate grinding and grain may also be dried prior to storage to prevent spoilage (Fenton, 1978, p.375). Evidence for the use of crop processing by-products as fuel in crop drying ovens in the Roman period is widespread (van der Veen 1989) and evidence for the use of such products as fuel used for crop drying in the medieval period is increasing. For example, evidence for the use of free threshing wheat chaff as fuel has been found in a 12th-13th century oven or kiln at Grange Lane, Leicester (Monckton and Radini, 2010), 12th-13th century ovens at West Cotton, Raunds (Campbell and Robinson, 2010) and several medieval sites in Cambridge (Ballantyne and de Vareilles, 2019; Simmons, 2020).

The rich assemblages of wild/weed plant seeds that are associated with crop material in the charred plant assemblages from Twycross also provide evidence for crop husbandry practices. The presence of seeds from typical crop weeds which are characteristic of heavy clay soils, soils with impeded drainage and nutrient rich soils, as well as seeds from crop weeds which are characteristic of lighter, free draining, acid soils and soils with low levels of fertility, suggest the cultivation of a range of different soil types. Bread wheat is suited to nutrient rich moist/loamy/silty/clayey soils while rye, barley and oats can tolerate lighter soils with lower levels of fertility (Ripon *et al*, 2014, p.211). The dominance of bread wheat in the samples from Twycross is therefore likely to be related to the widespread availability of damp loamy and clayey soils with moderate to high levels of fertility in the surrounding area (<https://www.landis.org.uk/soilscapes/index.cfm>). Twycross itself is however situated on a small area of freely draining, slightly acid soils which would have suited the cultivation of crops such as rye, barley and oats. This evidence suggests that the arable regime practiced at Twycross in the 11th-12th century may have included the utilisation of different soil types with different levels of fertility by growing a range of crops that were suited to the local environment. The abundance of grasses and leguminous taxa in the wild/weed seed assemblages may also point to the use of a crop rotation regime which included a period of fallow aimed at improving soil fertility (Carruthers and Hunter Dowse, 2019, p. 125).

The maximum height of wild/weed plants which are likely to have been growing in arable fields also provides evidence for the height at which harvesting took place. Stinking chamomile is an indicator that reaping was carried out relatively low on the cereal plant stem (Hillman, 1984, p.27). Other typical

crop weeds that are present in the wild/weed seed assemblages, such as scentless mayweed, cornflower, chickweed, cornsalad and pimpernel also indicate low reaping. Low reaping would result in the collection of straw, which is likely to have been a valuable commodity for use as fodder, bedding, temper or fuel in the medieval period (van der Veen, 1999).

The high diversity of taxa and the presence of high concentrations of charred plant remains in ditch [016], pit [031] and ditch [008] suggests that the charcoal assemblages in these features are derived from mixed domestic hearth or oven fuel. The composition of these wood charcoal assemblages suggests that, although large caliber mature oak was available, domestic fuel is likely to have consisted primarily of small caliber wood from a range of underwood trees/shrubs, scrub, hedgerow and wetland/riparian taxa. Heather may also have been collected for use as fuel from heathland or may have been present in turves used as fuel or construction material (Hall and Huntley, 2007, p.213). Potential evidence for the use of turves as fuel also includes charred sclerotia from the soil dwelling fungus *Cenococcum* in pit [033] and the small quantities of root/tuber/rhizomes in all the analysed samples. The high proportion of hazel roundwood in ditch [008] may indicate the use of coppiced hazel from managed woodland. In general, the composition of the charcoal assemblages in ditch [016], pit [031] and ditch [008] suggest the collection of twigs and small branches from a variety of sources, perhaps indicating a dearth of mature woodland trees for use as domestic fuel. Documentary sources suggest, however, that underwood from managed woodland was mostly used as domestic fuel in the medieval period, while standard trees such as oak were grown for use as timber, which was too valuable to be used as fuel (Rackham, 2003, p.137-146).

The predominance of mature heartwood of oak in pit [033], low diversity of other woody taxa and comparatively low concentration of charred crop material, suggests that wood charcoal assemblage from pit [033] may derive from a different source than the assemblages from ditch [016] pit [031], and ditch [008]. Oak is one of the best quality fuel woods when it has been well seasoned, as it produces high combustion temperatures and a long duration of burning (Hoare, 2020; Porter, 1990). Analysis of charcoal from Iron Age, Roman and medieval kilns in north-western France has produced evidence for a greater degree of selection in fuel used for craft kilns when compared to domestic kilns, and that oak was often selected for this purpose. Furthermore, the oak used in craft kilns was most often of large diameter wood, and it is suggested that this is due to the slow rise in kiln temperature and sustained fire which is produced by mature oak (Marguerie, 2002). This evidence points to the possibility that the charcoal assemblage from pit [033] may be derived from industrial rather than domestic fuel. Charcoal assemblages from mid/late Saxon pits at Roxton in Cambridgeshire produced similar evidence, whereby samples dominated by large calibre heartwood from mature oak produced very few charred plant remains and were also associated with evidence for metalworking in the form of hammerscale, while samples with more mixed charcoal compositions produced high concentrations of charred crop material (Warham and Simmons, 2023).

Conclusions

The evidence from Twycross for 11th-12 century crop processing and crop husbandry practices is significant, as medieval charred plant remains assemblages that include high concentrations of chaff and wild/weed plant seeds are relatively unusual, particularly from rural sites. The pits and ditches excavated at Twycross are likely to have been located close to an area where free threshing cereals were processed. Crop processing activities carried out in this area included the early stages of free threshing cereal processing. High concentrations of charred cereal grain also suggest the accidental charring of clean grain from a late stage in the crop processing sequence. The presence of by-products from the earlier stages of crop processing, which are mixed with charred cereal grain, may therefore indicate the use of crop processing by-products as fuel for crop drying, evidence for which is increasingly found at other medieval sites in central and southern England.

The arable economy at Twycross included the cultivation of the typical medieval crops of bread wheat, rye, oats and barley, along with flax and pulses including garden pea and common vetch. The wild/weed seed assemblages suggest the cultivation of heavy clay soils, light acidic soils, nitrogen rich soils and soils with lower levels of fertility. Bread wheat may therefore have been cultivated on local damp loamy and clayey soils with moderate to high levels of fertility to which this crop is suited, while oats, rye and barley may have been cultivated on local freely draining, slightly acidic soils. The abundance of vetches/vetchlings and grasses in the charred plant remains assemblage may indicate the practice of crop rotation with the use of a grass fallow. The wild/weed seed assemblages also suggest that crops were reaped low to the ground thereby maximised the straw harvest, which is likely to have been a valuable commodity used for fodder, temper, and fuel.

Analysis of wood charcoal from Twycross has also provided insight into the exploitation of the local environment for fuel wood and potential preferential selection of different fuel types for different activities. Domestic wood fuel consisted of largely small diameter branches and twigs from a diverse range of taxa which were collected from underwood, scrub and/or hedgerows as well heath and riparian/wetland areas. The high diversity and small calibre of the wood used as domestic fuel may indicate a dearth of more high-quality wood fuel during the 11th-12th century or may indicate preferential selection of small calibre underwood as domestic fuel. Large calibre mature oak was available, but may have been preferentially selected for use as non-domestic fuel.

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Charcoal recording tables

Context number		034							
Cut number		033							
Sample number		3							
Date		cal AD 1164-1260							
Context description		natural silting within pit							
Fragment No.	Taxon	Ring curvature ^a	Fungal hyphae ^b	Insect degradation ^b	Pith ^b	Bark ^b	Tyloses ^b	Reaction wood ^b	Vitrification ^c
1	<i>Quercus</i> sp.	1 (nr)					1		2
2	<i>Quercus</i> sp.	1					1		1
3	<i>Quercus</i> sp.	1					1		1
4	<i>Quercus</i> sp.	1							2
5	<i>Quercus</i> sp.								2
6	<i>Quercus</i> sp.								1
7	<i>Quercus</i> sp.								
8	<i>Quercus</i> sp.	1							1
9	<i>Quercus</i> sp.						1		
10	<i>Quercus</i> sp.								
11	<i>Quercus</i> sp.	1							
12	Indeterminate								
13	Indeterminate								3
14	<i>Quercus</i> sp.								1
15	<i>Quercus</i> sp.	1							
16	<i>Quercus</i> sp.						1		
17	<i>Quercus</i> sp.	1							
18	<i>Quercus</i> sp.						1		2
19	<i>Quercus</i> sp.						1		1
20	<i>Quercus</i> sp.						1		2
21	<i>Quercus</i> sp.	1					1		1
22	<i>Quercus</i> sp.								
23	<i>Quercus</i> sp.						1		1
24	<i>Quercus</i> sp.						1		1
25	<i>Quercus</i> sp.								2
26	<i>Quercus</i> sp.						1		
27	<i>Quercus</i> sp.								
28	<i>Quercus</i> sp.						1		1
29	<i>Quercus</i> sp.								
30	<i>Quercus</i> sp.						1		
31	<i>Quercus</i> sp.								2
32	<i>Quercus</i> sp.								2
33	<i>Quercus</i> sp.	1					1		2
34	<i>Quercus</i> sp.						1		1
35	<i>Quercus</i> sp.	1 (nr)					1		1
36	<i>Quercus</i> sp.						1		2
37	<i>Quercus</i> sp.						1		1
38	<i>Quercus</i> sp.								2
39	<i>Alnus glutinosa</i>								
40	<i>Quercus</i> sp.						1		2
41	<i>Quercus</i> sp.						1		1
42	<i>Quercus</i> sp.								2
43	<i>Quercus</i> sp.								2
44	<i>Quercus</i> sp.						1		1
45	<i>Quercus</i> sp.								1
46	<i>Quercus</i> sp.						1		2
47	<i>Quercus</i> sp.								1
48	<i>Quercus</i> sp.								1
49	<i>Quercus</i> sp.								2
50	<i>Quercus</i> sp.								2

^a1 = low curve rings; 2 = intermediate curved rings; 3 = strong curve rings. nr = narrow rings (<1mm wide), wr = wide rings (>3mm). ^b1 = yes.

^c1 = low brilliance; 2 = strong brilliance; 3 = total fusion

silt particles in every fragment

Context number		017							
Cut number		016							
Sample number		2							
Date		cal AD 1166-1264							
Context description		natural silting within gully							
Fragment No.	Taxon	Ring curvature ^a	Fungal hyphae ^b	Insect degradation ^b	Pith ^b	Bark ^b	Tyloses ^b	Reaction wood ^b	Vitrification ^c
1	<i>Quercus</i> sp.	1							
2	<i>Quercus</i> sp.	1							
3	<i>Quercus</i> sp.	1					1		
4	Indeterminate								
5	<i>Corylus avellana</i>								
6	<i>Quercus</i> sp.								
7	<i>Corylus avellana</i>	3	1						
8	<i>Quercus</i> sp.								
9	<i>Betula</i> sp.		1						
10	Indeterminate								
11	<i>Quercus</i> sp.								
12	<i>Quercus</i> sp.						1		
13	<i>Corylus avellana</i>		1						
14	<i>Populus/Salix</i> sp.								
15	<i>Quercus</i> sp.	1 (nr)					1		
16	<i>Quercus</i> sp.						1		
17	Indeterminate								3
18	<i>Calluna vulgaris</i>	3							
19	Maloideae								
20	<i>Quercus</i> sp.	1					1		
21	<i>Populus/Salix</i> sp.	3							
22	<i>Corylus avellana</i>		1						
23	Indeterminate								3
24	<i>Populus/Salix</i> sp.	3							
25	<i>Prunus</i> cf. <i>padus/avium</i>	2							
26	<i>Corylus avellana</i>	3			1				
27	<i>Corylus avellana</i>								
28	<i>Quercus</i> sp.								
29	<i>Quercus</i> sp.	1 (nr)					1		
30	<i>Quercus</i> sp.	3							
31	<i>Quercus</i> sp.								
32	<i>Quercus</i> sp.								
33	<i>Quercus</i> sp.						1		
34	<i>Corylus avellana</i>								
35	Maloideae								1
36	<i>Alnus glutinosa</i>								
37	Maloideae								
38	<i>Calluna vulgaris</i>	3 (5 rings)			1	1			
39	<i>Quercus</i> sp.						1		
40	<i>Quercus</i> sp.								
41	<i>Quercus</i> sp.								1
42	<i>Quercus</i> sp.	1					1		
43	<i>Quercus</i> sp.						1		
44	<i>Quercus</i> sp.	3							
45	<i>Quercus</i> sp.								
46	<i>Quercus</i> sp.						1		
47	<i>Alnus glutinosa</i>								
48	<i>Fagus sylvatica</i>								
49	Indeterminate								
50	Indeterminate								
51	<i>Prunus</i> cf. <i>spinosa</i>								1
52	Maloideae								
53	Maloideae								
54	<i>Quercus</i> sp.						1		
55	<i>Quercus</i> sp.								
56	<i>Quercus</i> sp.								
57	<i>Alnus glutinosa</i>								

58	Maloideae								
59	<i>Quercus</i> sp.								
60	<i>Alnus glutinosa</i>								
61	<i>Quercus</i> sp.						1		
62	Maloideae								
63	<i>Quercus</i> sp.								
64	<i>Quercus</i> sp.	1					1		
65	<i>Quercus</i> sp.						1		
66	<i>Calluna vulgaris</i>	3 (3 rings)							
67	<i>Quercus</i> sp.	3							
68	<i>Quercus</i> sp.						1		
69	<i>Quercus</i> sp.						1		
70	<i>Quercus</i> sp.						1		
71	<i>Corylus avellana</i>								
72	<i>Acer campestre</i>								
73	<i>Quercus</i> sp.								
74	<i>Quercus</i> sp.								
75	<i>Sambucus nigra</i>								
76	Indeterminate								
77	<i>Quercus</i> sp.						1		
78	<i>Quercus</i> sp.	1 (nr)					1		
79	<i>Acer campestre</i>								
80	Indeterminate								
81	<i>Quercus</i> sp.						1		
82	<i>Corylus avellana</i>								
83	<i>Quercus</i> sp.						1		
84	Maloideae								
85	<i>Corylus avellana</i>								
86	<i>Quercus</i> sp.	1 (nr)					1		
87	<i>Quercus</i> sp.						1		
88	<i>Quercus</i> sp.						1		
89	<i>Quercus</i> sp.								
90	<i>Quercus</i> sp.						1		
91	<i>Calluna vulgaris</i>	3							
92	<i>Alnus glutinosa</i>								
93	<i>Prunus cf. spinosa</i>								
94	<i>Quercus</i> sp.								
95	<i>Prunus cf. padus/avium</i>								
96	<i>Prunus cf. padus/avium</i>								
97	<i>Corylus avellana</i>								
98	<i>Quercus</i> sp.								
99	<i>Corylus avellana</i>								
100	Indeterminate								2

^a1 = low curve rings; 2 = intermediate curved rings; 3 = strong curve rings. nr = narrow rings (<1mm wide), wr = wide rings (>3mm). ^b1 = yes.

^c1 = low brilliance; 2 = strong brilliance; 3 = total fusion

Context number		032							
Cut number		031							
Sample number		4							
Date		cal AD 1037-1198							
Context description		natural silting within pit							
Fragment No.	Taxon	Ring curvature^a	Fungal hyphae^b	Insect degradation^b	Pith^b	Bark^b	Tyloses^b	Reaction wood^b	Vitrification^c
1	<i>Corylus avellana</i>	3	1						
2	<i>Frangula alnus</i>	3							
3	<i>Quercus</i> sp.	3			1				
4	<i>Calluna vulgaris</i>	3 (8 rings)			1	1			
5	<i>Corylus avellana</i>	3							
6	<i>Corylus avellana</i>	3							
7	Maloideae								
8	<i>Quercus</i> sp.						1		
9	<i>Corylus avellana</i>	3							
10	<i>Quercus</i> sp.						1		
11	<i>Populus/Salix</i> sp.					1			
12	Maloideae								
13	<i>Quercus</i> sp.	1 (nr)					1		1
14	<i>Calluna vulgaris</i>	3 (9 rings)			1	1			
15	<i>Quercus</i> sp.	1 (nr)					1		
16	<i>Populus/Salix</i> sp.								
17	<i>Corylus avellana</i>								
18	<i>Corylus avellana</i>	3							
19	Maloideae								
20	<i>Calluna vulgaris</i>	3							
21	<i>Quercus</i> sp.	1 (nr)					1		1
22	<i>Quercus</i> sp.						1		1
23	<i>Quercus</i> sp.	1 (nr)					1		
24	<i>Quercus</i> sp.	1 (nr)					1		
25	<i>Calluna vulgaris</i>	3							
26	<i>Corylus avellana</i>	3							
27	<i>Quercus</i> sp.	1 (nr)					1		
28	<i>Quercus</i> sp.	1 (nr)					1		
29	<i>Corylus avellana</i>	3							
30	<i>Corylus avellana</i>	3							
31	<i>Calluna vulgaris</i>	3 (3 rings)							
32	<i>Quercus</i> sp.								
33	Maloideae								
34	<i>Quercus</i> sp.	1 (nr)					1		
35	<i>Quercus</i> sp.								
36	<i>Corylus avellana</i>	3							
37	<i>Quercus</i> sp.	1 (nr)							
38	<i>Corylus avellana</i>								
39	<i>Corylus avellana</i>								
40	Indeterminate	3	1						
41	<i>Corylus avellana</i>	3							
42	<i>Ilex aquifolium</i>	3							
43	<i>Corylus avellana</i>								
44	Maloideae								
45	<i>Populus/Salix</i> sp.								
46	<i>Ilex aquifolium</i>	3							
47	<i>Quercus</i> sp.						1		
48	Maloideae								
49	Maloideae								
50	<i>Corylus avellana</i>								
51	<i>Quercus</i> sp.						1		2
52	<i>Quercus</i> sp.	1 (nr)							
53	<i>Quercus</i> sp.	3							
54	<i>Corylus avellana</i>								
55	<i>Quercus</i> sp.								
56	<i>Corylus avellana</i>								
57	<i>Sambucus nigra</i>								
58	<i>Calluna vulgaris</i>	3 (5 rings)			1	1			
59	<i>Corylus avellana</i>								

60	<i>Corylus avellena</i>	3							
61	<i>Corylus avellena</i>	3	1						
62	<i>Corylus avellena</i>								
63	<i>Quercus</i> sp.						1		
64	<i>Corylus avellena</i>								
65	<i>Quercus</i> sp.						1		
66	<i>Corylus avellena</i>	3							
67	<i>Calluna vulgaris</i>	3 (6 rings)			1	1			
68	<i>Populus/Salix</i> sp.								
69	<i>Quercus</i> sp.						1		
70	<i>Corylus avellena</i>	3							
71	<i>Populus/Salix</i> sp.								
72	<i>Ilex aquifolium</i>								
73	<i>Corylus avellena</i>								
74	<i>Ilex aquifolium</i>								
75	Maloideae								
76	<i>Corylus avellena</i>								
77	<i>Corylus avellena</i>								
78	<i>Corylus avellena</i>								
79	<i>Corylus avellena</i>	3							
80	<i>Corylus avellena</i>	3							
81	<i>Quercus</i> sp.								
82	<i>Quercus</i> sp.						1		2
83	<i>Quercus</i> sp.						1		
84	<i>Calluna vulgaris</i>								
85	<i>Corylus avellena</i>								
86	<i>Quercus</i> sp.								
87	<i>Quercus</i> sp.								
88	<i>Corylus avellena</i>								
89	<i>Corylus avellena</i>								
90	Maloideae								
91	<i>Populus/Salix</i> sp.								
92	<i>Corylus avellena</i>	3							
93	<i>Quercus</i> sp.								
94	<i>Calluna vulgaris</i>	3 (4 rings)							
95	<i>Populus/Salix</i> sp.								
96	<i>Quercus</i> sp.	1 (nr)					1		
97	<i>Ilex aquifolium</i>								
98	<i>Corylus avellena</i>								
99	<i>Corylus avellena</i>								
100	<i>Quercus</i> sp.	1 (nr)					1		

^a1 = low curve rings; 2 = intermediate curved rings; 3 = strong curve rings. nr = narrow rings (<1mm wide), wr = wide rings (>3mm). ^b1 = yes.

^c1 = low brilliance; 2 = strong brilliance; 3 = total fusion

Context number		009							
Cut number		008							
Sample number		1							
Date		cal AD 1037-1160							
Context description		natural silting within ditch							
Fragment No.	Taxon	Ring curvature ^a	Fungal hyphae ^b	Insect degradation ^b	Pith ^b	Bark ^b	Tyloses ^b	Reaction wood ^b	Vitrification ^c
1	Maloideae	1							
2	Maloideae	3							
3	Maloideae	2							
4	<i>Corylus avellana</i>	3							
5	<i>Corylus avellana</i>	3							
6	<i>Corylus avellana</i>	3			1				
7	<i>Corylus avellana</i>	3							
8	Maloideae	3							
9	<i>Fraxinus excelsior</i>								
10	<i>Corylus avellana</i>	3			1				1
11	<i>Corylus avellana</i>	3							
12	<i>Corylus avellana</i>								
13	<i>Corylus avellana</i>	3							
14	<i>Corylus avellana</i>	3			1				
15	<i>Corylus avellana</i>	3							1
16	<i>Ilex aquifolium</i>								
17	<i>Corylus avellana</i>								
18	Maloideae	2							
19	<i>Corylus avellana</i>								
20	<i>Corylus avellana</i>	3							
21	<i>Corylus avellana</i>	3							
22	<i>Corylus avellana</i>	3							
23	<i>Corylus avellana</i>	3							
24	<i>Corylus avellana</i>	3							
25	<i>Corylus avellana</i>	3			1				
26	<i>Corylus avellana</i>	3							
27	<i>Corylus avellana</i>	3							
28	<i>Corylus avellana</i>	3							
29	<i>Corylus avellana</i>	3	1						
30	<i>Corylus avellana</i>	3							
31	<i>Corylus avellana</i>	3							
32	<i>Corylus avellana</i>	3 (9 rings)							
33	<i>Corylus avellana</i>	3	1						
34	<i>Corylus avellana</i>	3							
35	<i>Corylus avellana</i>	3	1						
36	<i>Corylus avellana</i>	3	1						
37	<i>Populus/Salix</i> sp.								
38	<i>Corylus avellana</i>	3							
39	<i>Corylus avellana</i>	3				1			
40	<i>Corylus avellana</i>	3							
41	Maloideae		1						
42	<i>Corylus avellana</i>								
43	<i>Corylus avellana</i>	3							
44	<i>Corylus avellana</i>	3							
45	<i>Corylus avellana</i>	3							
46	<i>Corylus avellana</i>								
47	<i>Corylus avellana</i>	3							
48	<i>Corylus avellana</i>	3							
49	<i>Quercus</i> sp.	3							
50	<i>Corylus avellana</i>	3	1						
51	<i>Corylus avellana</i>	3							
52	<i>Corylus avellana</i>								
53	<i>Corylus avellana</i>								
54	<i>Corylus avellana</i>	3							
55	<i>Corylus avellana</i>								
56	<i>Corylus avellana</i>	3							
57	<i>Corylus avellana</i>								
58	<i>Corylus avellana</i>	3							

59	<i>Corylus avellana</i>	3							
60	<i>Corylus avellana</i>	3							
61	<i>Quercus</i> sp.		1				1		
62	<i>Corylus avellana</i>								
63	<i>Corylus avellana</i>	3	1						
64	<i>Prunus</i> cf. <i>spinosa</i>		1						
65	<i>Corylus avellana</i>	3							
66	<i>Corylus avellana</i>	3							
67	<i>Corylus avellana</i>	3							
68	<i>Corylus avellana</i>	3							
69	<i>Corylus avellana</i>	3							
70	<i>Corylus avellana</i>	3							
71	<i>Corylus avellana</i>								
72	<i>Corylus avellana</i>								
73	<i>Corylus avellana</i>								
74	<i>Corylus avellana</i>	3							
75	<i>Corylus avellana</i>	3							
76	<i>Corylus avellana</i>	3							
77	<i>Corylus avellana</i>								
78	<i>Corylus avellana</i>	3							
79	<i>Corylus avellana</i>								
80	<i>Corylus avellana</i>								
81	<i>Corylus avellana</i>								
82	<i>Quercus</i> sp.	3			1				
83	<i>Corylus avellana</i>								
84	<i>Corylus avellana</i>	3							
85	<i>Corylus avellana</i>								
86	<i>Corylus avellana</i>	3			1				
87	<i>Corylus avellana</i>	3							
88	<i>Corylus avellana</i>								
89	Maloideae								
90	<i>Corylus avellana</i>								
91	<i>Corylus avellana</i>	3	1						
92	<i>Corylus avellana</i>								
93	<i>Corylus avellana</i>	3							
94	<i>Corylus avellana</i>								
95	<i>Corylus avellana</i>								
96	<i>Corylus avellana</i>	3							
97	<i>Corylus avellana</i>	3	1						
98	<i>Corylus avellana</i>								
99	<i>Corylus avellana</i>								
100	<i>Corylus avellana</i>	3							

^a1 = low curve rings; 2 = intermediate curved rings; 3 = strong curve rings. nr = narrow rings (<1mm wide), wr = wide rings (>3mm). ^b1 = yes.

^c1 = low brilliance; 2 = strong brilliance; 3 = total fusion

Appendix 2: Context Summary List

Context	Type	Description	Length (m)	Width (m)	Thickness/ depth (m)	Interpretation
001	Layer	Firm, dark grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.10 - 0.30	Topsoil
002	Layer	Compact, mid brownish greyish orange sand with small sub-rounded poorly sorted stone inclusions			0.1	Natural
003	Cut	Sub-circular shaped post-hole with steep concave sides with a gradual break of slope to a concave base	0.4	0.46	0.36	Cut of post-hole
004	Fill	Firm, mid grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.36	Natural silting within post-hole [003]
005	Cut	Sub-circular shaped shaped pit with moderately steep concave sides with a gradual break of slope to a concave base	2.65	2.94	0.52	Cut of pit
006	Fill	Friable, mid brownish grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.32	Natural silting within pit [005]
007	Fill	Friable, mid grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.52	Natural silting within pit [005]
008	Cut	North north-east south south-west orientated linear ditch with gradual concave sides with a gradual break of slope to a concave base	25	1.15	0.44	Cut of ditch
009	Fill	Friable, mid grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.44	Natural Silting within ditch [008]
010	Cut	North-east south-west orientated linear gully with steep concave sides with a sharp break of slope to a flat base	5	0.5	0.22	Cut of gully
011	Fill	Friable, mid brownish grey sandy silt with moderate small sub-rounded poorly sorted stone inclusions			0.22	Natural silting within gully [010]
012	Cut	North-east south-west orientated linear gully with moderately steep concave sides with a gradual break of slope to a concave base	10	0.7	0.16	Cut of gully
013	Fill	Friable, mid brownish grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.16	Natural silting within gully [012]
014	Cut	North-west south-east orientated linear gully with moderately steep	5	1.06	0.24	Cut of gully

Context	Type	Description	Length (m)	Width (m)	Thickness/ depth (m)	Interpretation
		concave sides with a gradual break of slope to a concave base				
015	Fill	Friable, mid brownish grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.24	Natural silting within gully [014]
016	Cut	North northwest south southeast orientated linear gully with gradual concave sides with a gradual break of slope to a concave base	5	0.75	0.15	Cut of gully
017	Fill	Friable, mid grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.15	Natural silting within gully [016]
018	Cut	North north-west south south-east orientated linear gully with gradual concave sides with a gradual break of slope to a concave base	25	0.82	0.22	Cut of gully
019	Fill	Friable, mid grey sandy silt with occasional small sub-rounded poorly sorted stones			0.22	Natural silting within gully [018]
020	Cut	North-west south-east orientated linear gully with moderately steep straight sides with a gradual break of slope to a concave base	5	0.81	0.1	Cut of gully
021	Fill	Friable, dark greyish brown sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.1	Natural silting within gully [020]
022	Cut	North-east south-west orientated linear ditch with gradual concave sides with a gradual break of slope to a concave base	25	0.97	0.31	Cut of ditch
023	Fill	Friable, mid grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.31	Natural silting within ditch [022]
024	Cut	North north-west south south-east orientated linear ditch with gradual concave sides with a gradual break of slope to a concave base	25	0.6	0.13	Cut of ditch
025	Fill	Friable, mid grey sandy silt with occasional small sub-rounded poorly sorted stones			0.13	Natural silting within ditch [024]
026	Cut	North north-west south south-east orientated linear ditch with gradual concave sides with a gradual break of slope to a concave base	4.7	0.74	0.16	Cut of ditch
027	Fill	Friable, mid grey sandy silt with occasional small sub-rounded poorly sorted stones			0.16	Natural silting within ditch [026]

Context	Type	Description	Length (m)	Width (m)	Thickness/ depth (m)	Interpretation
028	Layer	Compact, light brownish grey sandy gravel with small and medium sub-angular moderately sorted stones	25	2.5	0.4	Made ground
029	Layer	Compact, mid brownish orange sandy clay with occasional small poorly sorted sub-rounded stone inclusions	25	2.5	0.2	Made ground
030	Layer	Firm, dark grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions	25	2.5	0.11	Made ground
031	Cut	Sub-circular shaped pit with steep concave sides with a moderate break f slope to a concave base	1.56	3.16	1.1	Cut of pit
032	Fill	Firm, dark grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			1.1	Natural silting within pit [031]
033	Cut	Sub-circular shaped pit with gradual concave sides with a gradual break of slope to a concave base	2.3	0.52	0.31	Cut of pit
034	Fill	Friable, mid grey sandy silt with small sub-rounded poorly sorted stone inclusions			0.31	Natural silting within pit [033]
035	Cut	East - west orientated linear gully with gradual concave sides with a gradual break of slope to a concave base	3.1	0.53	0.14	Cut of gully
036	Fill	Friable, mid grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.14	Natural silting within gully [035]
037	Cut	Sub-circular shaped pit with gradual concave sides with a gradual break of slope to a concave base	0.98	0.54	0.1	Cut of pit
038	Fill	Friable, mid grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.1	Natural silting within pit [037]
039	Cut	North-east south-west orientated linear gully with gradual concave sides with a gradual break of slope to a concave base	5.6	0.7	0.1	Cut of gully
040	Fill	Friable, mid grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions			0.1	Natural silting within gully [039]
041	Cut	North northwest south southeast orientated linear gully	5	0.75		Cut of gully
042	Fill	Friable, mid grey sandy silt with occasional small sub-rounded poorly sorted stone inclusions				Natural silting within gully [016]

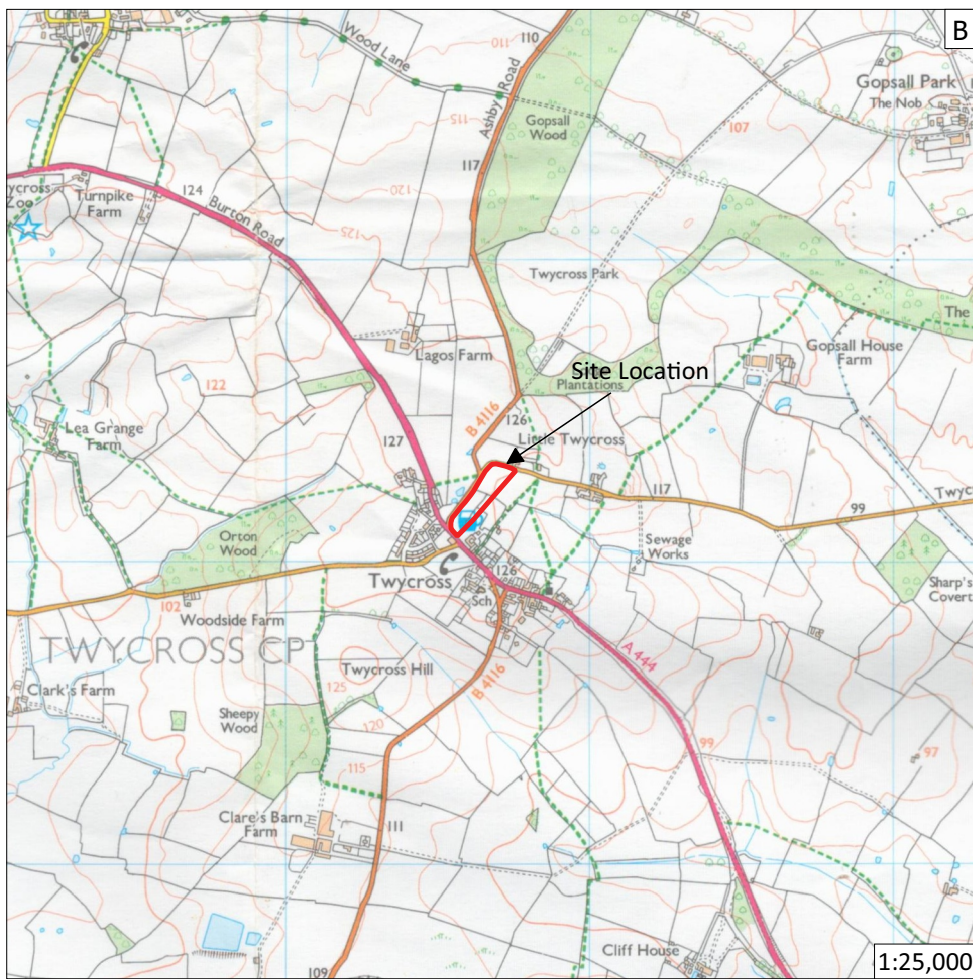
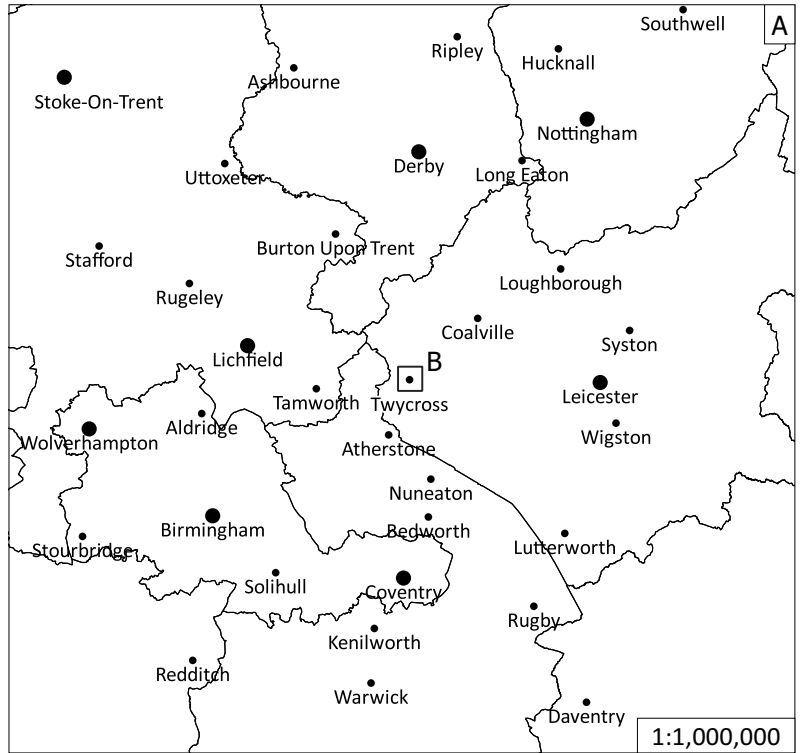
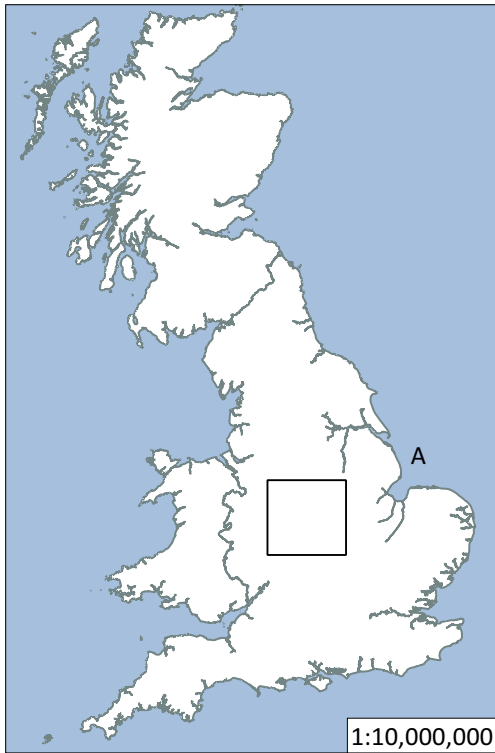


Figure 1: Site location outlined in red

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Site Code	TWAR 22
Scale	1:10,000,000 1:1,000,000 1:25,000 @ A4
Drawn by	A Lodoen
Date	06/07/2022

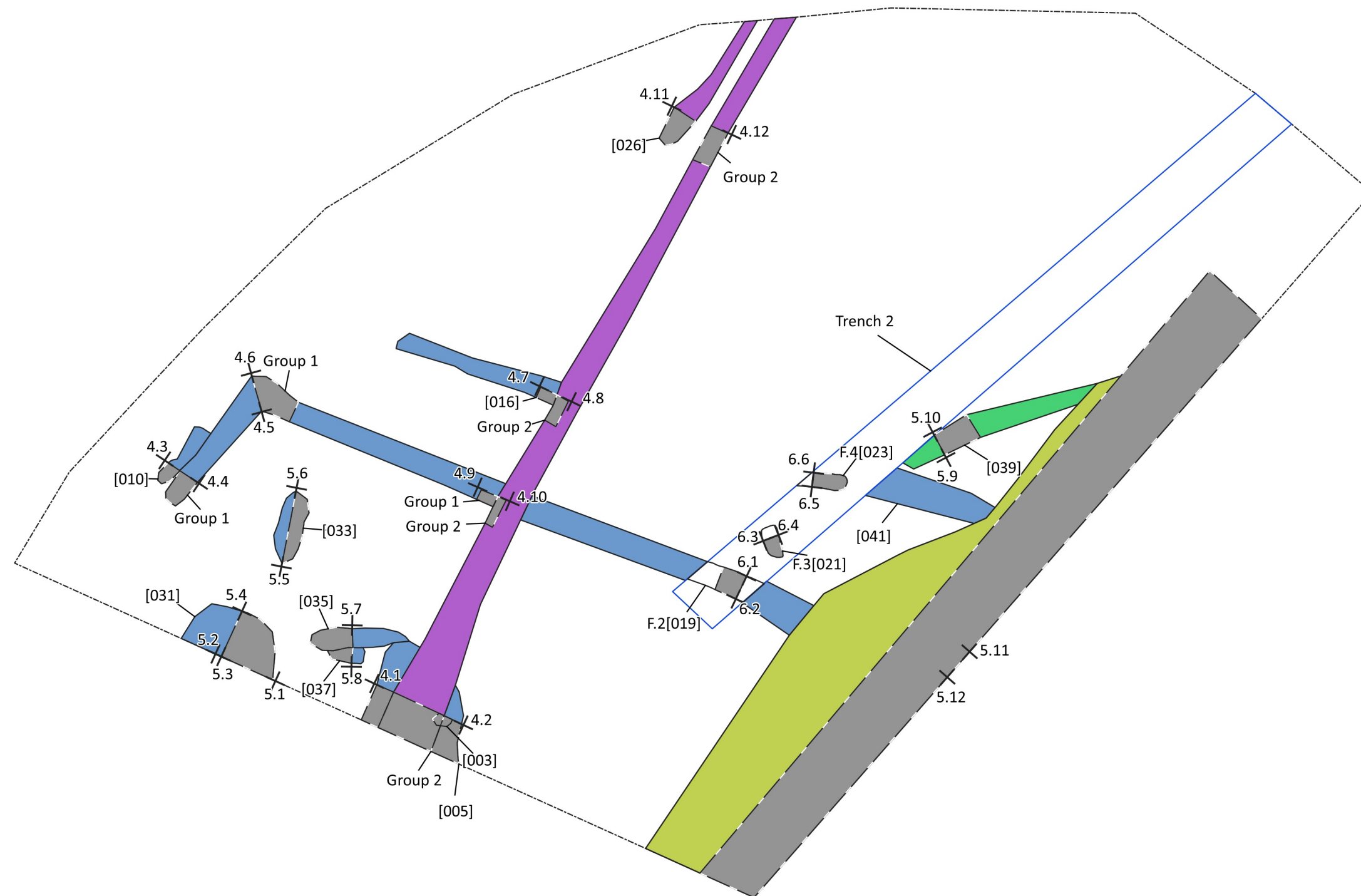




Key

- Site boundary
- Limit of excavation
- Archaeological feature
- Truncation (t)

Site Code	TWAR 22
Scale	1:600 @A3
Drawn By	R Brennan
Date	11/08/2022



Key

- Phase 1
- Phase 2
- Phase 3
- Phase 4
- Limit of Excavation
- Sondage
- Truncation
- Cut

Site Code: TWAR 22
 Scale: 1:150 @A3
 Drawn By: V Zoppi
 Date: 24/08/2022

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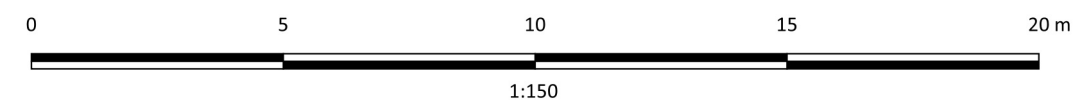
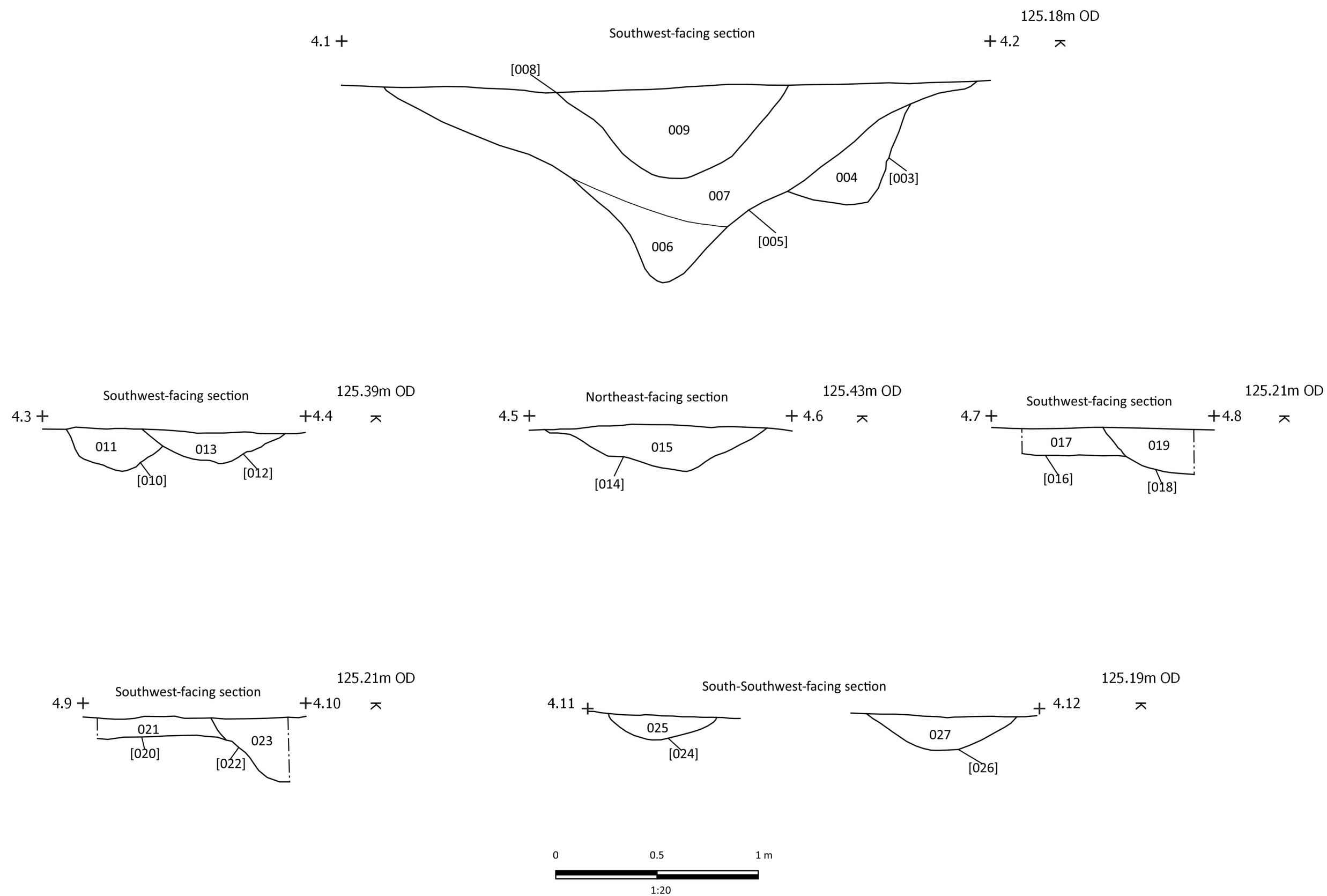


Figure 3: Plan of excavated features

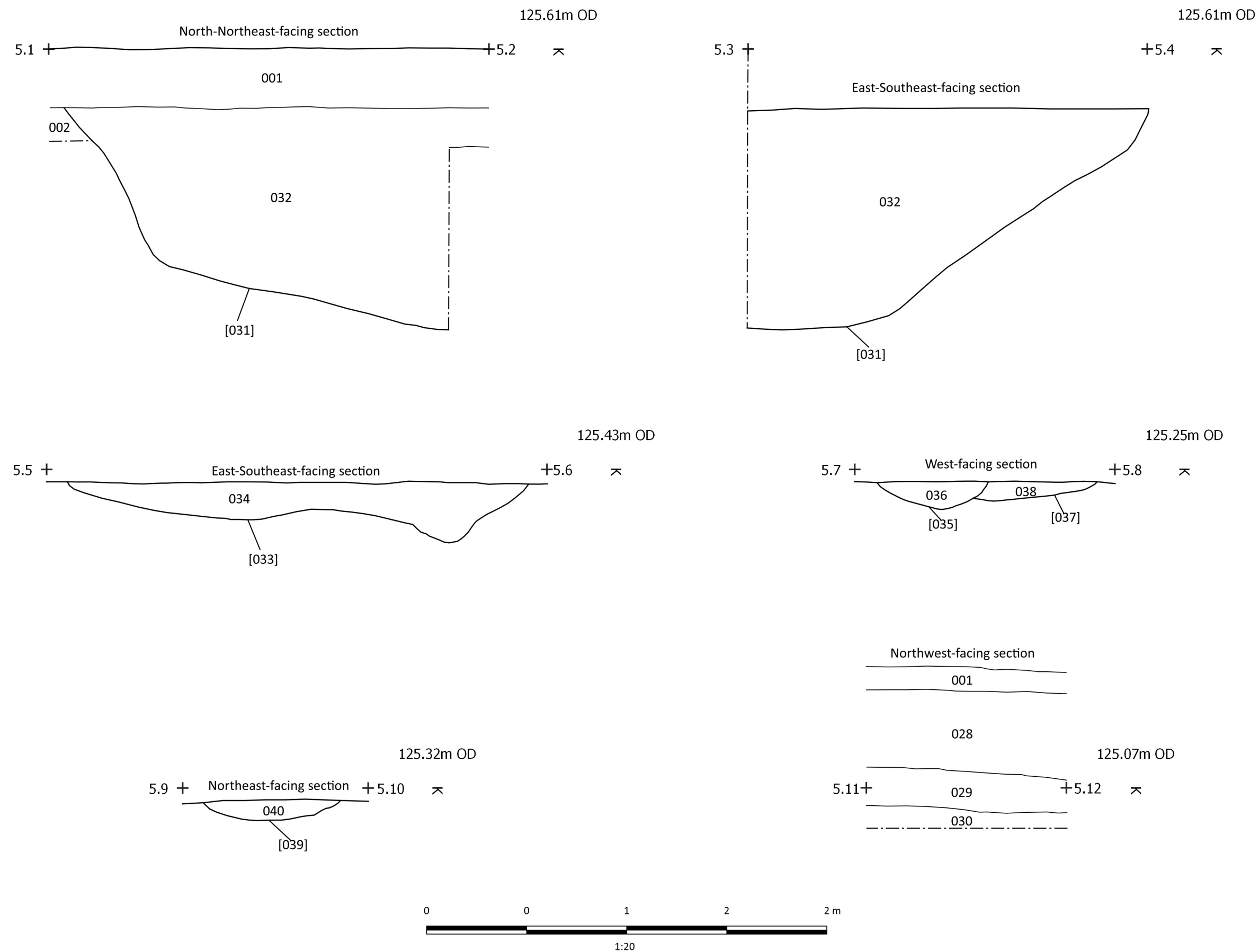


Key

- Cut
- Deposit
- - - Limit of excataion
- + + Section

Site Code	TWAR 22
Scale	1:20 @A3
Drawn By	R Brennan
Date	24/08/2022

Figure 4: Sections located on Figure 3



Key

- Cut
- Deposit
- - - Limit of excavation
- + + Section

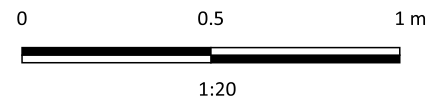
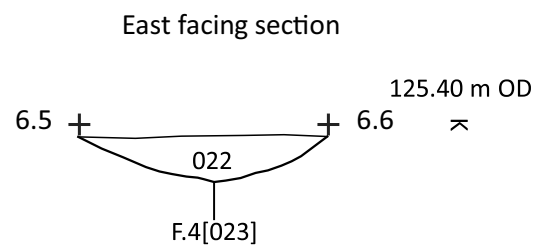
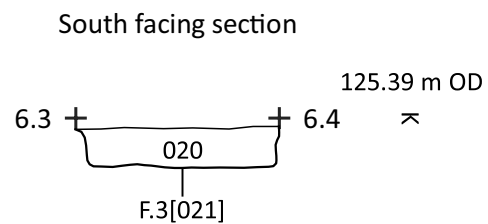
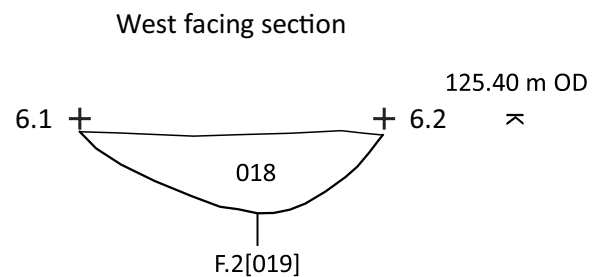
Site Code	TWAR 22
Scale	1:20 @A3
Drawn By	R Brennan
Date	11/08/2022

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Figure 5: Sections located on Figure 3



Site Code	Twar 22
Scale	1:20 @A4
Drawn By	V Zoppi
Date	19/08/2022

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Figure 6: Evaluation trench sections



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