CEFN GRAIANOG QUARRY, GWYNEDD

ASSESSMENT OF POTENTIAL FOR ANALYSIS REPORT

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

Cefn Graianog Quarry, Gwynedd

Assessment of Potential for Analysis Report

Project No. G1598

Report No. 1312

Prepared for: Ellesmere Sand & Gravel Co. Limited

April 2016

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Published by Gwynedd Archaeological Trust
Gwynedd Archaeological Trust
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1 INTRODUCTION

Gwynedd Archaeological Trust (GAT) was commissioned by *Ellesmere Sand & Gravel Co. Limited* to undertake an archaeological controlled strip of two areas as part of the long-standing monitoring of the quarry extension programme at Cefn Graianog Quarry (centred on SH 4589 4982) (Figure 1).

The archaeological work was undertaken during September and October 2014 prior to the extension of the quarry. A project design was prepared which sets out the legislation framework and planning background in detail for the archaeological work (Appendix I).

The current report was carried out in accordance with the *Management of Archaeological Projects 2* (MAP 2, English Heritage 1990), the Chartered Institute for Archaeology (CIfA) *Standard and guidance for archaeological excavation* (2014a), and *Standard and guidance for the collection, documentation, conservation and research or archaeological materials (2014b)*. Five stages are specified:

- Phase 1: Project planning
- Phase 2: Fieldwork
- Phase 3: Assessment of potential for analysis
- Phase 4: Analysis and report preparation
- Phase 5: Dissemination

This report has been produced as **Phase 3: Assessment of potential for analysis**. Recommendations for the work required for further analysis and report preparation (Phase 4), as well as dissemination (Phase 5), are included in Section 10, as well as within the updated project design which accompanies this report.

2 SITE LOCATION

Cefn Graianog translates as a gravely ridge (Mason 1998, xvi) and this name accurately describes the character of the area. The low hummocky ridge lies at the eastern end of the Lleyn Peninsula, within a basin of approximately 3km width and is surrounded by hills. Cefn Graianog rises to a height of 160m and forms an island in an area of wetter, heavier soils and bog. The soils from the basin are derived from glacial and fluvio-glacial deposit, mostly of Snowdonian origin, which have been heavily weathered under periglacial conditions. In poorly drained areas silty clays

and peat have formed, but the soils on the ridge are well drained, if stony, brown earths of the Arfon series, with brown podsols on the steeper slopes.

3 ARCHAEOLOGICAL BACKGROUND

The archaeological background has been discussed in full in the previous archaeological assessment (Flook 1994), and the reader is referred to that document. However, a brief summary is presented here.

3.1 PREHISTORIC AND ROMAN SITES

The early prehistory of the ridge is far from clear. Mesolithic occupation is predominantly concentrated in coastal areas and as yet no artefacts from this period have been discovered at Cefn Graianog. There are however some slight hints from the pollen record that forest clearance may have occurred before 4000 BC (Chambers 1998, 57) as a patch of burnt stone under a later burnt mound was dated to 5955-5500 cal BC (CAR-721) (Kelly 1992, 85). Kelly (*ibid.*, 86) dismisses the date as a result of dating inadequate quantities of charcoal, but a recent excavation about 1km southwest of the ridge also produced Mesolithic dates. The dates, ranging from 5310-6625 cal BC at 2 sigma, were from a deposit of charcoal within what may be a natural, periglacial formation (Kenney 2000). The evidence raises the possibility of deliberate burning of the vegetation in the Mesolithic period.

As in the preceding Mesolithic period, Neolithic structural and artefactual evidence is invisible on the Cefn Graianog ridge. It is however clear from pollen evidence that there was anthropogenic forest clearance during this period (Chambers 1998, 57). The long history of farming on the ridge began during this period, although no trace of these early farmers has yet been found. The nearest Neolithic monument is the chambered tomb at Penarth (PRN 199), situated 3.25km northwest of the ridge (Kelly 1998, 161).

The earliest monument on the ridge itself is a standing stone (PRN 124) of presumed Bronze Age date. Whilst the numerous cairns on the ridge are generally undated, the two located close to the standing stone are presumably also Bronze Age, and appear to be funerary monuments rather than clearance cairns (PRN 224 and 225). These three monuments are collectively scheduled as Cn98 (Mason 1998, xix). The pollen evidence shows phases of clearance and regeneration throughout the Bronze Age, and the presence of burnt mounds may indicate Bronze Age settlement in the area (Kelly 1998a, 161). One of these mounds (PRN 129) was excavated (Kelly 1992), producing dates demonstrating its use between the third and early second millennium BC, and later in the late second to early first millennium (Kelly 1998a, 161). There is another burnt mound site, 175m south of the excavated one, which appears to be a complex site with three conjoined mounds (PRN 3997). The chance

discovery of a ring (PRN 3446), of the type known as Bronze Age ring money, by a farm worker in 1970, suggests Bronze Age activity near the summit of the ridge.

Major and sustained forest clearance started on the ridge in the mid first millennium BC, and the earliest settlement sites discovered so far date from the mid-2nd century BC. Three hut groups have been excavated on the ridge (Mason 1998). The Graianog site and Cefn Graianog II were founded in the 2nd century BC and continued through the end of the Roman period (Kelly 1998b; Mason and Fasham 1998). The third hut group, Cefn Graianog I, was established in the 2nd century AD, and again continued to the end of the Roman period. There may have been a fourth hut group (PRN 118) 300m to the west of Graianog (Kelly 1998a, 162) and there are similar sites about 1km away to the southwest of Caerau (PRN 108 and 109). The Iron Age is further represented in the area by a small hillfort (PRN 203) on Y Foel, the rounded hill to the north of the area (Mason 1998, xix).

3.2 Medieval and Later Periods

Although the hut groups went out of use at the end of the Roman period the pollen record showed that ridge continued to be farmed, and the settlements had probably not moved very far away (Kelly 1998a, 162). Resettlement of the ridge probably occurred from the 10th century AD. The Graianog hut group site was reoccupied sometime between the 10th and 13th centuries (Kelly 1998b).

In 2007 a truncated sub-circular ditch was uncovered to the west of Cefn Graianog Farm. The ditch was cut into the glacial horizon and measured 0.8m in width and covered an area *c*. 20m across (Roberts 2008). Two radiocarbon dates were obtained from samples recovered from the ditch fill (KIA38220 and KIA38219). Both dates suggested a date within the 8th to 9th centuries AD.

A medieval homestead (PRN 120) was excavated by Kelly (Kelly 1982) and was found to have been in use between the 11th and 13th centuries. A further group of medieval platform houses (PRN 123) were located on the bog margin to the south, but they were destroyed without excavation (Kelly 1998a, 162). A possible medieval farmstead (PRN 3999) and an isolated platform house (PRN 4360) are located on the northeastern slope of the ridge.

In the medieval period Graianog first appears in the written history, the confirmation of the grant of 'Grayanawt' to the *clas* of Clynnog Fawr, in the 1209 charter of Llewelyn ap Iorwerth, probably refers to the excavated medieval homestead (PRN 120) (Kelly 1998a, 162). Modern Graianog was probably founded in the 15th century, when the pollen record shows intensified clearance activity. The present settlement was certainly established by the early 17th century, when a farmhouse was built. This is now a Grade II listed building (RCAHMW 1960, site 800, p44). The modern farm of Cefn Graianog was founded in the mid-19th century, and was demolished in 1990 in advance of quarrying (Kelly 1998a, 160,162). The existing field system probably dates to the early 19th century, when fields were enlarged to open up areas for

progressive farming techniques (Flook 1994, 4). Gravel extraction has taken place on the ridge for at least 100 years, with large-scale extraction started after the Second World War (Mason 1998, xvi). The quarrying activity has been the impetus for much of the archaeological work on the ridge, as sites have been excavated in advance of the gravel extraction.

3.3 PREVIOUS WORK

The original assessment of the quarry expansion area was undertaken in 1994 by GAT for *Tarmac Quarry Products Ltd.* (Flook 1994) and this was followed by a series of watching briefs and archaeological evaluations to the south of the latest extensions.

Evaluation undertaken in 2007 to the south of the latest extension at (NGR SH 4600 4980) revealed the presence of a truncated sub-circular ditch (Figure 1) which was initially believed to be prehistoric in date, however two radiocarbon dates obtained from samples taken from the ditch fill suggested a *terminus ante quem* within the 8th century AD (Roberts 2008). The ditch was cut into the glacial horizon and measured 0.8m in width and covered an area *c*. 20m across. The provenance of this feature was unclear but the date range corresponded with the known evidence for resettlement of the area from the 8th century AD (Flook 1994: 4), as represented by the hut group at (NGR SH 4550 4945; PRN 118), located *c.* 650m to the southwest. No evidence was found of a suspected platform house identified as Feature 09 in the original 1994 assessment which was located at NGR SH 4602 4978, within the 2007 evaluation plot.

Evaluation of the area to the south and southeast of the latest extension between 2009 and 2011 (Figure 1) produced very little evidence of archaeological activity with the exception of a cobbled trackway and charcoal rich pit. The trackway located at NGR SH 4612 4979 appeared to have been constructed in two phases with a possible period of abandonment in between, represented by a build-up of peaty soil (Owen 2010).

Evaluation undertaken in 2012 and 2013 immediately to the south and east of the latest extension (Figure 1) identified a total of 22 archaeological features. These included two burnt pits dating to between the 18th - 20th centuries BC, in the Early Bronze Age; a posthole alignment dating to between the mid 7th century to late 8th century AD; and metalworking features dating from the late 7th century to the late 9th century AD (GAT forthcoming).

4 AIMS AND OBJECTIVES

The original aim of the programme of work was to identify any archaeological remains revealed prior to the start of quarrying. Appropriate mitigation measures were developed for all archaeological remains revealed.

The current objective is to prepare an archaeological archive of the site to ensure the long-term curation of the recovered data. This is to include the treatment and preservation of any finds, deposition of the archive at an agreed repository or repositories, and the detailed analysis and publication of results to an appropriate level in line with nationally defined guidelines.

The original aims of the controlled strip were to:-

- establish the extent to which archaeological remains survive at the site;
- establish the date and nature of archaeological remains at the site and assess their implications for understanding the historical development of the area;
- establish the depth of archaeological remains and the quality, value and level of preservation of any deposits;
- and assess the level of risk any surviving remains may pose to development.

5 METHODOLOGY

5.1 FIELDWORK METHODOLOGY

All works were carried out in accordance with the Project Design for the works (Appendix I) and the GAT standard operating procedures as set out in the GAT fieldwork Manual (*in prep)*).

All groundbreaking was undertaken under constant archaeological supervision. All archaeological features encountered were hand excavated. Where appropriate isolated pits and postholes were subject to 50% excavation, linear features 10% excavation, and more complex features 100% excavated. All sections were drawn at a scale of 1:10.

Hand drawn sections and plans were produced where appropriate, at a scale of 1:10 and 1:20 respectively and tied into the National Grid. The use of photogrammetry software was also undertaken on site so as to produce accurate (<2cm) plans of structures which were also tied into the National Grid.

A written record of all identified features was completed using standard GAT pro-forma sheets and a running photographic record was maintained using a Nikon digital SLR camera set to maximum resolution. All features were digitally surveyed using a Trimble TSC2 controlled GPS receiver (Trimble R6 Unit), with the results tied into the National Grid.

Bulk soil samples (a minimum of 10 litres and maximum of 30 litres) were taken for flotation of charred plant remains. These bulk samples were taken from contexts containing charcoal and/ or slag to allow the recovery of both charred plant remains and small artefacts not easily recovered by hand.

5.2 POST EXCAVATION METHODOLOGY

A site database has been created in Microsoft Access into which basic site information has been entered. A database of the site photographs has also been produced to enable active long-term curation of the photographs and easy searching. The site records have been checked and cross-referenced and photographs, plans, finds, and samples have been cross-referenced to contexts. An initial site narrative has been written and the extent to which this needs to be expanded will be considered below.

The field drawings have been combined with the survey data to produce a plan of the site as well as a number of detailed plans and sections. The requirement for more detailed illustrations and for interpretative drawings has been included in the archive report method statement below.

All paper field records have been scanned to provide a backup digital copy. The photographs have been organised and precisely cross-referenced to the digital photo record so that the Royal Commission of Ancient and Historical Monuments of Wales can curate them in their active digital storage facility.

The finds have been catalogued and grouped by material type. All finds, where appropriate, have been cleaned. All finds have been packaged in suitable containers and conditions for long-term storage. Objects requiring conservation have been identified. The finds have been assessed by specialists to describe and catalogue the collections and identify pieces to be drawn and any requirement for further study. Insignificant items recommended for discard have also been identified.

The sampling strategy for bulk soil samples was related to the perceived character, interpretational importance, and chronological significance of the strata under investigation. This ensured that only significant features were sampled. The aim of the sampling strategy was to recover carbonised macroscopic plant remains and small artefacts.

6 QUANTIFICATION OF RESULTS

Field records

Context sheets	264
Drawings	31 drawings on 5 sheets
Digital photographs	382

Environmental Samples

Total Samples: 92 x 10 litre tubs from 41 contexts

Finds

Stone	5
Metal	1
Total	**6**

7 FIELDWORK RESULTS

7.1 INTRODUCTION

This section provides a summary of the results of the excavation. The controlled stripping resulted in the identification and recording of 123 archaeological features within Area A (3) and Area B (120). The features uncovered during the archaeological works were mostly concentrated in three main areas within Area B (Figure 4-6), with the remaining features consisting of isolated pits or linear features (Figures 2 and 3). These are discussed by area below. For a detailed description of all the features and deposits uncovered during the archaeological works see Appendix II.

7.2 GEOLOGY AND TOPOGRAPHY

The natural geology across the site comprised of a light to mid reddish brown sandy loam with large areas of gravel and stone dispersed throughout (**268**). Subsoil was visible across the site, on average 0.1m thick, and consisting of a brownish black sandy silt (**267**). This was sealed by a dark brownish black sandy silt topsoil (**266**), on average 0.2m thick. All features uncovered were cut into the natural geology and sealed by the subsoil unless stated otherwise.

Area A comprised of an area of approximately 8,588m^2 which sloped down gently from 140.7m in the south to 136.6m in the north. Area B comprised of an area of approximately 9,987m^2 which sloped down from approximately 145.2m in the south to 133.9m in the north, initially gradually but with a more pronounced slope towards the northern end.

7.3 AREA A (FIGURE 2)

At the northwestern end of Area A, a sub-rectangular pit (**001**), aligned approximately NNE-SSW and measuring 4.1m by 1.4m was uncovered. This was filled with a mottled greyish brown silty sand containing sherds of post-medieval pottery. Towards the southeastern end of this area a large natural spread of sub-rounded and sub-angular stones (**004**/ **006**), measuring a maximum of 56.5m by 40.6m, was revealed.

A linear ditch (**007**) aligned roughly NNE-SSW and measuring 1.2m in width with a depth of 0.28m was also uncovered within this area. The NNE end of the ditch was obscured by stone spread **004**/ **006**. Excavation of the stone spread in this area failed to show the linear ditch continuing in this area and it is likely that the ditch either terminated prior to this point or that it became a lot shallow when the stonier ground was encountered and has therefore been truncated out by ploughing/ stripping.

At the southeastern end of Area A, a small, shallow, sub-circular feature (**002**), measuring approximately 1.1m by 0.65m was uncovered. Upon excavation it was revealed to be most likely the result of bioturbation or a stone hole.

7.4 AREA B ISOLATED FEATURES (FIGURE 3)

A total of 15 isolated features were uncovered within Area B. One of these features, a possible pit (**043**), was only partially revealed, as it was located at the northwestern edge of the site, and continuing outwith the site limits. It was left unexcavated, and fenced off so that it could be dealt with in full as part of the next phase of works on site. Of the remaining 14 isolated features, nine of them were revealed to have likely been formed by either bioturbation (**039**, **041**, **045**, **047**, **049**, **051**) or the result of stone disturbance (**033**, **053**, **055**). The remaining five features are discussed below.

Two Circular pits (**029** and **031**) were uncovered towards the southwestern edge of Area B, measuring approximately 0.35m and 0.5m in diameter respectively. Both pits were on average 0.15m deep and contained a single silted up fill consisting of a dark brownish grey clayey silt (**030** and **032** respectively). The pits were located 0.45m apart and given their similar shape and fills are most likely contemporary.

A large, sub-oval pit (**120**) was revealed towards the northwestern edge of Area B (Plate 01). It measured approximately 2.2m by 1.2m, with a maximum depth of 0.23m. It was primarily filled with an in-situ burning deposit (**122**), a maximum of 0.23m thick. This was partially sealed by a naturally silted up layer of greyish brown clayey silt (**121**), 0.12m thick.

Towards the northern end of Area B, two large pits (**068** and **072**) approximately 12m apart were uncovered. Pit **068** was sub-circular in shape, measuring 2.1m by 1.4m with an average depth of 0.3m, however at its northeastern end its depth increased to 0.8m (Figure 10). This deeper part of the pit was filled with multiple thin lenses of light brown or grey silt (**071**), 0.62m thick, and was sealed by a grey clayey silt deposit (**069**), 0.31m thick.

A sub-rectangular pit (**072**) was located approximately 12m to the WNW of pit **068**. It had fairly steep sides with a flattish base and measured 2.1m by 1.4m, with a depth of 0.42m (Plate 02). Two initial silting up deposits (**074** and **113**) were located at the WSW end of the pit, measuring 0.13m and 0.17m in thick respectively. Both these deposits were sealed by a 0.42m thick grey clayey silt deposit (**073**), representing the main silting up event (Figure 11).

The remains of an upstanding field boundary wall (**009**) aligned roughly east-west and running along the northern limit of Area B were also recorded (Plate 03). Only the rubble foundations, measuring approximately 2.5m wide and with a maximum height of 0.5m, remained. The foundations consisted of sub-rounded and sub-angular, medium to large stones set into the natural geology.

7.5 AREA B NORTHEASTERN CORNER (FIGURE 4)

A linear ditch (**057**), aligned roughly ENE-WSW was located towards the northeastern corner of the site (Figure 2). It measured approximately 1m in width, with a maximum depth of 0.3m, and continued outwith the excavation area. It was filled with a thin light reddish brown sandy silt (**059**), which was sealed by a reddish brown sandy silt (**058**), 0.28m thick.

A possibly natural slope (**236**) was uncovered within the northeastern corner of Area B. The full extent of the slope was not revealed due to its location at the very edge of the site, although it measured at least 26.2m in length, with a width of at least 3.2m and a depth of >0.4m. It had been filled in/ levelled out with a series of dumped burnt deposits (**237**). A small irregular shaped pit (**238**), measuring 1.15m by 0.5m, and with a depth of 0.21m, was revealed adjacent to, and running into the natural slope (**236**). It was filled with a single deposit of burnt stone and black silt (**239**), although no evidence of in-situ burning was visible.

A small concentration of features, consisting of four pits (**100**, **102**, **105**, and **116**), two shallow postholes (**110** and **118**), two deposits (**098** and **099**), and a large stone hole (**109**) (Figures 4 and 15) (Plate 04), were uncovered adjacent to slope (**236**). Deposit **098** consisted of a 0.05m thick layer of burnt, black clayey silt with frequent charcoal inclusions and showed signs of multiple in-situ burning events. It covered an area of approximately 1.25m by 1.1m and sealed posthole **110**. Deposit **099**, also 0.05m thick and adjacent to this deposit, consisted of a spread of burnt material covering an area measuring approximately 1.5m by 1.3m. No evidence of in-situ burning was visible within this deposit and pits **100**, **102**, and **116**, as well as posthole **118** were sealed by it.

Pits **100** and **116**, sealed by deposit **099**, were located adjacent to pit **102** and were both sub-rectangular in shape. They measured 0.55m by 0.35m and 0.36m by 0.24m respectively. Both were filled with a greyish black burnt silt with frequent charcoal and burnt stone inclusions (**101** and **117** respectively), 0.28m and 0.11m thick respectively. No evidence of in-situ burning was visible within either of the pits.

Pit **102** was sub-oval in shape and measured 1m by 0.75m, with a depth of 0.4m. A number of deliberately placed stones (**104**), laid flat at the base of the pit, were uncovered (Plate 05), along with signs of in-situ burning. These stones were sealed by a charcoal rich greyish black clayey silt deposit (**103**), 0.34m thick. Adjacent to, and partially truncated by pit **102** was another sub-oval pit (**105**). It was very similar in size, measuring 1.05m by 0.65m, and with a depth of 0.22m. A layer of stones (**108**) was also visible at the base of this pit along with evidence of in-situ burning (**107**) (Plate 06). However, the stones appeared to be more randomly placed than those within pit **102**. These were sealed by a 0.15m thick layer of mottled grey and reddish brown clayey sand (**106**).

7.6 AREA B SOUTHEASTERN CORNER (FIGURE 5)

At the southeastern corner of Area B a roughly linear feature (**064**), aligned approximately east-west was revealed. It was filled with a brownish grey stony silt (**065**), and measured approximately 11m in length, with a maximum width of 1.6m and a depth of 0.2m. Directly to the north of this feature, a northwest-southeast aligned gully (**066**) was uncovered running for approximately 6.5m. No relationship between these two features could be seen. The gully was 0.5m in width, with a depth of 0.25m and contained a single silted up clayey silt fill (**067**). It terminated approximately 2.1m to the southeast of semi-circular gully **028** which had a similar width (0.54m) and depth (0.18m).

Semi-circular gully **028** had an external diameter of approximately 7m, and both ends appeared to peter out rather than terminate. It was filled with a single greyish brown sandy silt deposit (**093**). Six postholes (**077**, **079**, **083**, **085**, **089**, and **091** (Figure 12)) and a possible sub-circular pit (**075**) were uncovered either within the area enclosed by the semi-circular gully or immediately outside it to the NNE (Figure 5, Plate 07). The postholes measured on average 0.4m by 0.35m, with a depth of 0.25m, and were arranged in a possible line, running NNE-SSW, dividing the semi-circular gully roughly in half. They were all filled with a very similar silted up deposit comprising of a light greyish brown sandy silt (**078**, **080**, **084**, **086**, **090**, and **092** respectively). Three further sub-circular features (**081**, **087**, and **094**) were also uncovered within this area. However, upon excavation these appeared to be either bioturbation or stone holes. A further stone hole (**070**) was located to the ESE close to the limit of excavation.

A number of small, sub-circular and irregular features (**011**, **015**, **019**, **021**, **024**, **026**, **035**, and **057**) were revealed to the north and west of semi-circular gully **028**. However, upon excavation the majority of these appear to have been formed by either bioturbation, animal burrowing, or are the result of stone disturbance. The exception to this is sub-rectangular pit **017**, which measured 0.73m by 0.65m and had a depth of 0.11m. Its primary fill consisted of a charcoal rich sandy silt deposit (**018**), although no signs of in-situ burning were visible. A greyish brown sandy silt deposit (**023**) with charcoal inclusions, and with a maximum thickness of 0.06m, was located sealing part of this deposit, towards the centre of the pit.

Further north, two interconnecting shallow curvilinear gullies (**183** and **184**) were uncovered. Gully **183** was 8m in length, aligned approximately ESE-WNW, and continued into the previously excavated are to the east. Gully **184** was curvilinear in shape and ran for approximately 13m in a roughly northeast-southwest orientation. Both gullies were on average 0.5m wide with a depth of 0.09m, and were filled with a similar greyish brown sandy silt deposit (**185** and **186** respectively). A smaller linear feature (**197**) measuring 4.7m in length, with a maximum width of 0.61m and a depth of 0.14m, was revealed to the west of these gullies. It was filled with a single silted up deposit consisting of a greyish orangey brown sandy silt (**198**).

Directly to the northwest of gullies **183** and **184**, a sub-rectangular stone platform (**231**) was revealed, set into the natural geology and located within a shallow, sub-oval depression (**228**), measuring 5.15m by 4m, and with a maximum depth of 0.1m. The stone platform measured 3.4m by 0.9m and was constructed from sub-rounded and sub-angular stones measuring between 0.1m by 0.1m by 0.1m and 0.3m by 0.25m by 0.2m. The platform was aligned northeast-southwest and a line of stones were set on their edge along its southeastern edge (Figure 6, Plate 08). A 0.1m thick layer of naturally silted up dark brown sandy silt (**228**) sealed this platform, as well as a small sub-circular pit (**229**), and a large spread of slag and in-situ burning (**260**) covering an area of approximately 2.2m by 2m. Sub-circular pit **229** measured 0.45m by 0.28m, with a depth of 0.2m and was filled with a mixture of burnt stone and slag (**230**). The spread of slag and in-situ burning (**260**) was on average 0.05m thick and sealed a small sub-oval pit (**263**) and a large circular posthole (**261**). Pit **263** measured 1m by 0.5m, with a depth of 0.05m and was filled with a greyish black clayey silt (**264**) with the occasional burnt stone. The large posthole (**261**) measured approximately 0.28m in diameter and had a depth of 0.35m. It was filled with a dark grey clayey silt (**262**).

7.7 Area B Central Area (Figure 6)

The largest concentration of features uncovered on the site was located within a 30m by 20m area in the centre of the site, towards the southern end of Area B (Figure 3). Within this area there were two smaller sub-concentrations of features along with a few outlying features, and these are described by area below.

7.7.1 Area B Central Area - Sub-Concentration A (Figure 7)

A thin irregular spread of brownish grey sandy silt (**133**) was uncovered measuring approximately 7m by 3.5m by 0.05m, within the central area of Area B. Upon excavation this deposit was seen to be sealing a large number of features (21) and was most likely the result of the natural silting up of this area after the underlying features had gone out of use. With the exception of posthole **175** all the following features were at least partially sealed by this deposit.

A sub-rectangular shallow feature (**131**) was uncovered at the western edge of this spread, measuring 1.5m by 1.35m, and with a maximum depth of 0.11m. Its irregular shape and uneven sides and base suggest that it is just a natural depression. It was filled with a single soft brownish grey sandy silt (**132**), which may form part of the same silting up episode as overlying spread **133**. Directly adjacent to the ESE side of this feature, a circular posthole (**134**) measuring 0.25m in diameter and with a depth of 0.35m was uncovered. It was filled with a single silted up deposit of soft brownish grey sandy silt (**135**), and no evidence of a post or post packing was visible within the fill. Two possible postholes (**136** and **138**) were located to the SSW and southeast of posthole **134** respectively. Both were approximately 0.2m in diameter with a depth of 0.1m and were filled with a similar brownish grey sandy silt deposit (**137** and **139** respectively). Given their shallow nature in contrast to the other

postholes uncovered in the area, it is possible that these are stone holes rather than the truncated remains of postholes.

Towards the southern edge of spread **133**, two irregular features (**157** and **159**) were uncovered. Feature **157** measured 0.18m by 0.14m, while feature **159** measured 0.65m by 0.35m. Both features were on average 0.12m deep and were filled with a similar grey clayey silt deposit (**158** and **160** respectively). Given their irregular shape and shallow nature then these features most likely represent stone holes or bioturbation.

To the northeast of these features a group of three postholes (**161**, **164**, and **175**), in a rough triangular shape were uncovered (Plate 09). Postholes **161** and **164** were both approximately 0.28m in diameter with an average depth of 0.18m, while posthole **175** measured 0.2m in diameter and with a depth of 0.14m. Both postholes **164** and **175** were filled with a single silted up deposit comprising of a brownish grey clayey silt (**165** and **176** respectively). Posthole **161** also contained a similar deposit (**162**), however a greyish brown silt and gravel deposit (**163**) was also visible around the edges of this posthole (Figure 13) which may represent packing for a post.

To the north of these postholes a roughly square pit (**172**), measuring 1.1m by 0.93m and with a depth of 0.32m was uncovered. The basal fill of this pit consisted of a 0.18m thick greyish brown silt deposit (**174**), which was sealed by a 0.15m thick deposit of greyish brown silt and stone (**173**). At the base of this pit, and roughly in the centre, a small possible stakehole (**224**) with a diameter of 0.07m and a depth 0.05m was revealed (Plate 10) possibly sealed by deposit **174**. It was filled with a dark greyish black clayey silt deposit (**225**).

A small shallow pit (**170**) was revealed partially truncated by the southern edge of pit **172**. It was sub-oval in shape, measuring 0.4m by 0.3m, and with a depth of 0.07m. Evidence of in-situ burning was visible at its base and it was filled with a single charcoal rich black clayey silt deposit (**171**), most likely representing a burning event. A similar sub-oval pit (**166**) was located to the WNW, adjacent to the western edge of pit **172**. This feature measured 0.35m by 0.25m, with a depth of 0.05 and signs of in-situ burning were also visible at its base. It was filled with a charcoal rich black clayey silt (**167**), again most likely representing a burning event. A circular posthole (**168**) was uncovered to the north of pit **166**, and directly adjacent to pit **172**. It measured approximately 0.2m in diameter, with a depth of 0.28m and was filled with a single brownish grey clayey silt deposit (**169**).

To the north of these features a small line of three postholes (**151**, **178**, and **226**) was uncovered adjacent to three pits (**149**, **153**, and **155**). These postholes measured between 0.2m and 0.25m in diameter with depths of between 0.2m and 0.35m, and were all filled with a single greyish brown clayey silt with occasional charcoal flecks throughout (**152**, **179**, and **227** respectively).

Pits **153** and **155** were both sub-rectangular in shape, aligned ENE-WSW, and measured 0.6m by 0.45m with an average depth of 0.18m. They were located adjacent and parallel to the line of postholes (**151**, **178**, and **226**). Both pits were filled with a similar charcoal rich greyish black clayey silt (**154** and **156** respectively), and were visible intercutting each other. However given the similarity in their fills the exact relationship between them could not be determined.

Pit **149**, orientated northwest-southeast, and located adjacent to posthole **151**, was sub-rectangular in shape, measuring 1.75m by 0.95m and had a maximum depth of 0.28m. The basal fill of this pit consisted of multiple thin lenses of charcoal rich greyish black clayey silt (**150**), in total 0.28m thick, representing multiple in-situ burning events. This was sealed by a 0.26m thick pale grey clayey loam (**148**), which most likely represented a single deliberately dumped deposit. Fragments of slag were recovered from both of these fills.

Sub-rectangular pit **141** was uncovered truncating the southeastern end of pit **149**. It measured 1.2m by 1.1, with a depth of 0.32m and was filled with a single deliberately dumped deposit of sub-rounded stones (**142**). Two postholes (**143** and **145**) were uncovered adjacent to the northern edge of pits **141** and **149** respectively (Plate 11). These postholes measured on average 0.2m in diameter with a depth of 0.2m, and were filled with a brownish grey clayey silt (**144** and **146** respectively). No evidence of a post or post packing was visible within them.

7.7.2 Area B Central Area - Sub-Concentration B (Figures 8 and 9)

At the northern edge of this concentration of features, a thin (0.07m) spread of dark brownish black sandy silt (**210**) was revealed within a natural shallow depression, measuring approximately 2m by 1.5m. To the southeast of this an irregular shaped shallow pit (**208**) was located measuring 3.5m by 2.5m, with a depth of 0.1m and filled with a single dark brownish black sandy silt deposit (**209**). This feature appeared to truncate the northwestern terminus of a slightly curvilinear gully (**206**), which was aligned approximately northwest-southeast, and ran for 3.4m before terminating. It measured 0.55m in width, with a maximum depth of 0.16m and was filled with a single compact greyish brown gravelly clayey silt (**207**). The gully may have continued at a shallower depth for a further 1.2m towards hollow **213** to the southeast, as there was a very shallow depression in this area, although this may be a natural depression (Figure 8).

The largest feature in this area was a sub-rectangular hollow (**213**), aligned northwest-southeast, and measuring 6.7m by 4.4m, with a maximum depth of 0.35m. It was located on a natural slope and had naturally silted up with a brown clayey silt deposit (**214**), which sealed a stone hearth (**215**), a stone platform (**232**), a circular pit (**222**), and possibly a small curvilinear gully/ pit (**217**), and a linear gully (**211**) (Figure 8). The circular pit (**222**) was uncovered towards the southwestern edge of the hollow (**213**). It measured approximately 0.5m in diameter with a depth of 0.55m and was filled with a greyish brown gravelly silt deposit (**223**).

A stone hearth (**215**), aligned northwest-southeast, and set within a shallow depression, was uncovered towards the southeastern end of hollow **213**. It was constructed with two long parallel stones set at both the northwestern and southeastern side, and orientated northeast-southwest. Two smaller stones were located at either end of both of these stones (Figures 8 and 9, Plate 12). The hearth measured 0.85m by 0.35m internally, 1.14m by 0.6m externally, and was filled with a charcoal rich black silt containing fragments of burnt bone (**216**). The adjacent stone platform (**232**) was located abutting up against the northwestern edge of the hearth, suggesting that the hearth was built earlier than the stone platform.

The stone platform (**232**) uncovered in this area measured 4.2m by 3m, and was aligned roughly northwest-southeast (Figure 8, Plate 13). It was constructed from sub-angular stones, laid flat and measuring between 0.1m by 0.1m by 0.1m and 0.5m by 0.4m by 0.3m. There were no distinct edges to this platform and a 0.35m wide section through the middle appears to have been robbed out, suggesting that the edges may have been robbed out as well. No evidence of burning or metal working was visible on the stone platform. The stone platform was set into a probable levelling layer consisting of a dark greyish brown clayey silt (**233**), 0.05m thick, which sealed five postholes (**247**, **250**, **252**, **258**, and **265**), four pits (**219**, **240**, **242** and **244**), and a possible stake hole (**254**) (Figure 9). Due to the likely robbing out of the edges of the stone platform, it is also likely that linear gully **211** and curvilinear gully/ pit **217** were also originally sealed by this deposit and/ or the stone platform.

A small group of three interconnecting postholes (**247**, **250**, and **252**) were located directly to the northwest of hearth **215**, sealed by levelling layer **232** (Plate 14). All three were approximately 0.25m in diameter with an average depth of 0.22m. Posthole **247** had a layer of stones (**249**) packed around its side, most likely representing post packing, although no remains of an actual post were visible. This was sealed by a greyish brown gravelly silt (**248**), similar to the single fills of postholes **250** and **252** (**251**, and **253** respectively). Given the similar nature of their fills it was impossible to tell which posthole truncated which.

Linear gully **211** was located running slightly downslope from southeast-northwest away from the edge of hollow **213**. It measured approximately 3.5m in length, with an average depth of 0.1m, and was filled with a deliberately dumped burnt deposit consisting of a charcoal rich clayey silt with fragments of slag throughout (**212**). A curvilinear gully/ pit (**217**) was located to the south of this feature, measuring 1.8m in length with a width of 0.45m, and a depth of 0.25m. It was filled with a similar deliberately dumped deposit or charcoal rich clayey silt with fragments of slag throughout (**218**).

Sub-oval pit **219** was located directly to the northeast of gully/ pit **217** and to the southeast of gully **211**. It measured 1.75m by 1.1m and had a maximum depth of 0.2m. A 0.03m thick layer of burnt clay and silt (**257**) was uncovered at the base of

this pit, which was sealed by a charcoal rich black clayey silt containing fragments of slag (**221**), 0.17m thick. The truncated remains of a possible posthole (**265**) was revealed at the base of pit **219**, and sealed by the burnt clay layer (**257**). It measured 0.2m in diameter, with a depth of 0.06m and was filled with a black clayey silt deposit (**256**).

A 1.5m long sub-rectangular pit (**244**) was visible truncating the southeastern edge of pit **219**. The pit measured 1.5m by 0.35m and had a depth of 0.5m. It was filled with a single greyish brown and black clayey silt and stone deposit (**246**). Directly to the northeast of this pit and adjacent to pit **219**, a sub-circular posthole (**258**) was revealed. Approximately 0.32m in diameter and with a depth of 0.35m, it was filled with a single brownish grey clayey silt deposit (**259**).

Pits **240** and **242** were located at right angles to each other and aligned approximately northeast-southwest and northwest-southeast respectively (Plate 15). Both pits were sub-rectangular in shape and measured approximately 1.1m in length with a width of 0.5m and a depth of 0.25m. Evidence of in-situ burning was visible within the southwestern end of pit **240** and fragments of slag were recovered from its fill, which consisted of a dark blackish grey clayey silt (**241**). In contrast, pit **242** was filled with a single silted up deposit consisting of a brownish grey clayey silt (**243**). A possible stakehole (**254**), 0.1m in diameter and with a depth of 0.2m was uncovered at the intersection of these two pits (Figure 9). It was filled with a dark blackish grey clayey silt (**255**). However, given the lack of any other stakeholes in the area it is possible that this feature was formed by bioturbation or animal burrowing.

7.7.3 Area B Central Area - Outlying Features (Figure 6)

The outlying features uncovered within Area B consisted of four pits (**124**, **126**, **181**, and **200**), three linear features (**187**, **202**, and **204**), two spread deposits (**180** and **199**), and two stone holes (**129** and **189**). Pits **124** and **126** were located directly to the north of the main concentrations of features. Pit **124** was sub-circular in shape, measuring 0.9m by 0.985m with a depth of 0.32m, while pit **126** measured 1.35m by 0.6m, with a depth of 0.19m, and was sub-rectangular in shape. Both pits were filled with a similar blackish grey burnt clayey silt containing fragments of slag (**125** and **126** respectively).

A slight depression, measuring approximately 4.8m by 3.2m, and with a maximum depth of 0.2m was located to the southwest of the main concentrations of features. It had been naturally silted up by a greyish brown silt (**180**). Directly to the southeast of this depression, a small roughly square pit (**181**), measuring 0.55m by 0.55m, and with a depth of 0.22m was uncovered. It was filled with a single light brownish grey clayey silt deposit (**182**).

A large linear feature (**187**), aligned northwest-southeast and measuring approximately 5m in length, with a maximum width of 1m and a depth of 0.34m, was

uncovered to the southwest of depression **180**. It was filled with a soft mottled grey and brown slightly clayey sand (**188**).

Two further linear features (**202** and **204**) were uncovered to the southeast of depression **180**. Linear gully **202** was aligned approximately northeast-southwest and ran for 4.6m, while linear gully **204** was aligned perpendicular to this and measured 7.3m in length. Both gullies measured approximately 0.5m in width with an average depth of 0.16m. Gully **202** was filled with a light to mid greyish brown clayey sand (**203**), while gully **204** was filled with a single silted up deposit comprising of a mid to dark grey silty sand (**205**)..

A small sub-circular pit or posthole (**200**) was located directly to the southwest of the terminus of gully **202** and may be associated with this feature. It measured approximately 0.48m in diameter with a depth of 0.25m, and was filled with a single silted up deposit consisting of a light to mid greyish brown clayey silt (**201**). Another sub-circular feature (**189**) was uncovered directly north of this feature. However, upon excavation it was revealed to most likely represent bioturbation or a stone hole.

A 0.1m thick, sub-oval spread of greyish brown clayey silt (**199**), measuring 2.1m by 1.3m, was revealed within a small shallow depression directly to the southeast of the gully **202**. This most likely represents a natural depression in the ground which has gradually silted up over time.

8 SUMMARY OF SPECIALIST REPORTS

The full assessment reports by the relevant specialists are given in the appendices, and these are summarised here.

8.1 PALAEOENVIRONMENTAL SAMPLES

The soil samples were processed by flotation and wet sieving by Brython Archaeology, and were subsequently assessed by Rosalind McKenna. A total of 41 samples were submitted for assessment (Appendix III).

The samples produced some environmental material of interpretable value, with the plant macrofossils from 25 samples, and the identifiable charcoal remains from 38 of the samples. The deposits from which the samples derive, mainly represent the intentional deposition or accumulation of domestic waste associated with fires.

The remains of plant macrofossils recovered from the samples showed the utilisation of wheat, barley, and oat as well as indeterminate cereal grains, and chaff fragments, together with a range of weed seeds typically associated with cultivation. Hazel nuts were also present within the samples. The hazelnut shells recovered may be indicative of a food source being consumed, perhaps as a snack and their husks being added to the fires as a method of waste disposal. However, the hazelnut shell fragments show no marks typically associated with processed shells. Together with the high portion of hazel charcoal, this may indicate that they are merely representative of hazel wood trees being burnt, which could be either a natural or a man-made process.

The fact that the samples have produced broadly similar results suggests that these secondary deposits do not result from deposition of debris from accidental charring events, but instead represent a consistent pattern of charring cereal grain, chaff and crop weeds over the period of occupation

In terms of taphonomy, it is likely that the samples from pits, postholes, gullies, ditches, all represent secondary deposition of charred plant remains. This probably occurred through intentional dumping. The use of cereal processing waste as fuel is well attested (Hillman 1981; 1984) and disposal of spent fuel either into features such as pits or ditches/ gullies or directly dumped onto the site seems a likely explanation for the arrival of this material on site. As the majority of the plant remains were found together with charcoal remains, it may suggest that waste or spilt grain were put on the fire with other rubbish and a small fraction became charred without burning up, and joined the domestic ash on the rubbish heap. It is possible that charred debris from cereal crop parching, possibly also in combination with other crop processing waste used as fuel, was redeposited in the features. Intentional dumping of charred debris (such as spent fuel, charred debris from

parched crops etc.) seems the most likely explanation for the formation of the majority of the deposits encountered here.

The charcoal remains showed the exploitation of a several species native to Britain, including Oak, Willow/ Poplar, Hazel, and Ash. Oak has good burning properties and would have made a fire suitable for most purposes (Edlin 1949). Willow/ Poplar are species that are ideal to use for kindling. They are anatomically less dense than for example, oak and ash and burn quickly at relatively high temperatures (Gale & Cutler 2000, 34, 236, Grogan *et al.* 2007, 29-31). Hazel is also recorded as a good fuel wood and was widely available within oak woodlands, particularly on the fringes of cleared areas (Grogan *et al.* 2007, 30). Ash is strong and tough, and makes excellent firewood producing both heat and flame. It will also burn when green (Grogan et al. 2007, 30).

These dryland wood species indicate the presence of an oak-ash woodland close to the site. The evidence of carr fen woodland within the samples indicate a damp environment close to the site. This type of woodland would have consisted of willow and poplar which are all trees that thrive in waterlogged and damp soils, particularly in areas close to streams or with a high water table (Stuijts 2005, 143 and Gale & Cutler 2000).

As asserted by Scholtz (1986) cited in Prins and Shackleton (1992: 632), the “Principle of Least Effort” suggests that communities of the past collected firewood from the closest possible available wooded area, and in particular the collection of economically less important kindling fuel wood (which was most likely obtained from the area close to the site).

8.2 Stone

Five stone objects were assessed by George Smith (Appendix IV). One, from the fill of pit **068** was identified as a natural glacial pebble. The remaining four consisted of three undateable flint flakes or chips from the fills of postholes **079** and **083**, and pit **172**; and a secondary flint blade of probable Later Mesolithic or Early Neolithic date recovered from the subsoil.

8.3 Iron Nail

A single iron nail, 70cm in length, was recovered from spread **228** and examined by Jörn Schuster of ArchaeologicalSmallFinds. It was a wrought nail with shank square (*c*. 6x6mm) below a missing head. The lower half was rectangular-sectioned, tapering to slightly rounded tip.

Nails like this would have been used for a multitude of purposes like joining wooden constructions, furniture or even coffins. The form is not chronologically distinctive as nails with square to rectangular shanks have been known since the Iron Age (Jörn Schuster, pers. comm.).

8.4 ARCHAEOMETALLURGICAL RESIDUES

The archaeometallurgical residues were examined visually with a low-powered binocular microscope where required by Dr Tim Young of GeoArch (Appendix V). The materials were not subjected to any high-magnification optical inspection, nor to any form of instrumental analysis and therefore the identifications of materials are necessarily limited and must be regarded as provisional.

8.4.1 Results

Bloomery Iron Smelting Residues

The majority of the material comprised of flow slags, either from conventional flows or from masses of coalesced flows, commonly superficially resembling tapped slag, although some were elongate and fragile. The coalesced specimens were themselves typically rather elongate and narrow. There were no pieces of substantial accumulations and none of these materials showed any reddening of their surfaces.

Most of the individual flow lobes and tubes within the flow slag were small (less than 15mm in diameter), but some contexts contained a significant proportion of much broader, inflated lobes, probably indicating continued slag supply with little lateral flow. A further 830g of flow slag accumulations showed a slightly reddened, maroon surface, suggesting surficial oxidation of the slag when hot, which may occur when slag is tapped from the furnace. A small quantity of fragments (290g) of narrow slag rods and runners, probably related to the flow slags, were also noted within the material studied.

Most of the flow slags showed bases dimpled through contact with fuel, although some were entirely rough-surfaced, suggestive of flow through the basal ashy sediment. Some of the otherwise smooth-surfaced flows showed slight wrinkling of the upper surface from contraction or deflation, and some showed an unusual minutely dimpled texture cause by a very high vesicularity just below the top of the flow lobes.

Smithing Slags

There were no complete, certain examples of smithing hearth cakes (SHCs), but several fragments that may derive from SHCs were recovered. None was a certain example.

There were also two fragments from the burr region of slag cakes (the burr is the zone where the hot zone impinges on the wall, just below the blowhole, resulting in erosion by melting of the wall into a smoothly arcuate embayment with a highly indurated surface). Burrs may develop in both smelting furnaces and smithing hearths; the present examples are small and resemble those formed in smithing hearths, however they are also thin, which is a feature more commonly found in smelting furnace slags.

Indeterminate Residues

There was a variety of dense slags with a charcoal-rich or more massive fabric, or fragmented to a degree to which they no longer exhibited diagnostic features that might allow them to be assigned to either smithing or smelting. In addition, there was a total of 283g of vitrified hearth or furnace ceramic and 112g of slag derived mainly from the melting of the wall, with little input of iron. Neither group could be attributed to a specific process with any certainty, and most of this material occurred in very small fragments.

Iron Ore

Small particles of iron ore occurred widely in the sieved samples, both as raw and haematised (roasted) pieces, typically with a particle size of less than 2mm. The macroscopic collections also included ore material.

Most of the ore is a bog iron ore with thin veinlets and mottles of a pinkish-brown hydrated iron oxide. A lesser proportion of the material appears to be very manganese-rich, with small fragments of soft wad-like concretions, together with tubular concretions in a similar material.

Other

The macroscopic collections included, in addition to the material described above, rare fragments of fired clay that were not demonstrable hearth/ furnace lining; occasional fragments of vitrified or glazed pebbles; and concretions formed around iron or slag (sometimes containing charcoal and hammerscale).

The microscopic residues were rich in clasts of stone (some magnetic, especially where heated), occasional burnt bone fragments, and finely granular magnetic material (some of which may be ore, but some perhaps secondary minerals derived from alteration of slag or iron).

The assemblage also included three examples of thin slag films with a right angled re-entrant. Such slag films are usually caused by slag adhering to the tip of the smith's poker or tongs. Although typically an indicator of smithing, such artefacts might also be formed during smelting.

8.4.2 Interpretation

The amount of archaeometallurgical waste recovered from the site was relatively low. This may reflect the deposition of the waste into slag mounds or other areas of deposition not preserved into the archaeological record. There were no large, deep features close to the likely foci of activity to have accumulated waste. Much of what is preserved was located within either shallow features or in spreads that are most likely represent the working floors.

The majority of the residues at Cefn Graianog are indicative of bloomery iron-smelting. The details of the technology are unclear: although the majority of material suggests an origin in a non-slag tapping furnace. Such furnaces may have had a simple basal pit or chamber, into which the slag descended during the smelt, or they may have had a lower section of the shaft with a frontal arch (to permit clearance of the slag and probably the bloom) which functioned in the same manner. Some of the material, however, showed evidence for slag tapping (the common occurrence of elongate composite flow slag pieces, reddening of the slag surface and presence of deformed flow slags).

The interpretation of the smithing activity is hampered by the paucity of evidence. There are very few pieces of slag interpretable as the macroscopic residues of smithing. Hammerscale is, in contrast, locally abundant and generally widespread. The dominance of flake hammerscale would suggest the working of at last partly-consolidated iron (Young 2011) rather than the welding of blooms. This may suggest that the raw blooms produced by smelting were being smithed down to bar (or at least billet) on the site.

9 INTERPRETATION

9.1 AREA A

The sub-rectangular pit (**001**) uncovered within this area can be dated to the post-medieval period by the sherds of pottery within its single fill. However, the function of this pit is unknown.

The large spread of stones (**004**/ **006**) are likely to have either been dumped in this area as part of a clearance or naturally gravitated to this area since this area would originally have been the base of a slope, although this has now been quarried out.

Also uncovered within this area, linear ditch **007** is likely to represent an old field boundary ditch given its fairly straight nature. However, no finds were recovered from its fill and therefore the date of the boundary is unknown.

9.2 AREA B ISOLATED FEATURES

The fills of isolated pits **029**, **031**, and **072** contained no finds, with the exception of a small piece of flow slag from the upper fill of pit **072**, which most likely accumulated within the pit as part of its natural silting up process. The function or date of these features is unknown. However, due to their proximity to each other, along with their similar shape and fills, it is likely that pits **029** and **031** are contemporary with each other. The presence of the small piece of flow slag within pit **072** would also suggest that it was contemporary with the nearby metalworking features, such as those within the northeastern corner (see below section 9.3).

A small amount of flow slag (21g), along with fragments of undiagnostic dense slag (16g), was recovered from the upper fill of pit **068**. However, due to the small amount of slag and the lack of any other evidence of metal working within the pit, it is unlikely that the pit was connected with the metal working process, and that these fragments accumulated as part of the natural silting up of the pit. The depth of the pits northeastern end, along with the multiple thin silting up events within this part of the pit, suggest that the pit may have been used as a small well/ water storage which gradually silted up over multiple uses. The presence of the small amount of slag within the upper fill of this pit would also suggest that it was fairly contemporary with the nearby metalworking features within the northeastern corner (see below section 9.3).

In-situ burning was visible within pit (**120**), and the sampling revealed a high concentration of grass, cereal, and weeds, as well as a large amount of cereal chaff within its fill. The high amount of cereal chaff within this pit may suggest that cereal processing was taking place here, with the waste of this processing being used for fuel within the other features on site. A small amount of dense slag (68g) was also recovered from the fill of this feature, however none of it was diagnostic, and given

the small amount, it is likely that it accumulated within the pit from the nearby metalworking features within the central area of the site (see below).

The field boundary wall (**009**) runs along the edge of a natural slope and appears to connect into the stone wall enclosure around the platform house to the east of Area B and is most likely associated with this feature.

9.3 Area B Northeastern Corner

The linear ditch (**057**) which was located towards the northeastern corner of the site appears to run perpendicular with the existing field boundary wall between Areas A and B and it is likely that it relates to an extant field boundary which was contemporary with this.

The possibly natural slope (**236**) which was uncovered within the northeastern corner of Area B had been filled in/ levelled out with a series of dumped burnt deposits (**237**). These dumped deposits are likely to have been the waste from the metalworking activity seen in features uncovered to the south in 2013 (GAT forthcoming), the southwest (see below section 9.4), as well as the small concentration of features directly adjacent (see below). The small irregular shaped pit (**238**) which was located adjacent to and running into the slope, contained fragments of charcoal, although there was no evidence of in-situ burning, and it is likely that this represents a waste pit contemporary with the concentration of features located directly south (see below).

The concentration of features uncovered adjacent to the possible natural slope (**236**) consisted of four pits (**100**, **102**, **105**, and **116**), a couple of shallow postholes (**110** and **118**) and two deposits (**098** and **099**). Deposit **098** showed signs of multiple in-situ burning events, suggesting this was an open hearth. The adjacent deposit **099**, had no signs of in-situ burning, but contained a moderate amount of flow slag (38g) and undiagnostic dense slag (110g), and most likely represents the waste from this hearth. The location of the two postholes (**110** and **118**) suggests that they may have formed a small structure for holding something over the hearth (**098**). With the exception of the slag from deposit 099, no further evidence of metalworking was uncovered within any of the other features in this area, suggesting that the function of these features was not primarily related to the metal working process, although there actual function is unknown.

There was no evidence of in-situ burning within pits **100** and **116**, and they may therefore represent waste pits for the burnt material. The presence of the flat base stones within pit **102**, along with the evidence of in-situ burning, suggests that this pit was used for heating something that could be placed on the stones, possibly in a similar way as an oven, with heated stones place around the object on the stones. The burnt stones located within the upper fill of this pit, could have been heated up within the open hearth indicated by deposit **098**.

Possible base stones were also uncovered within pit **105**, however these stones were not as neatly placed, or as even as those at the base of pit **102**, which may suggest a more basic construction or that the base was partially robbed out when it went out of use, rather than a different function. Even though pit **102** truncates pit **105** it is likely that they are fairly contemporary given their similar form and the relative absence of any other features in this area.

9.4 AREA B SOUTHEASTERN CORNER

The linear feature (**064**) uncovered at the southeastern corner of Area B appears to be the continuation of feature **20.2013** uncovered during the 2013 excavations (GAT forthcoming) which was identified as a dump of stones associated with field clearance.

Both ends of the semi-circular gully (**028**) appeared to peter out rather than terminate and given its shallow nature and the downward gradient of the natural geology in this area, it is possible that the northern part of this feature has been ploughed out. If this is the case then it may have originally been circular in plan and could represent a drip gully for a roundhouse. However, no internal features associated with a roundhouse were located within the area encompassed by the gully. This feature may therefore represent a smaller, semi-circular enclosure used primarily for shelter from the wind/ rain. The postholes located within or immediate outside of the area enclosed by the gully were arranged in a possible line, running NNE-SSW, dividing the gully roughly in half. This may suggest that they were used to construct a further wind/ rain break allowing the enclosure to be used on either side depending on wind direction. Two of the postholes (**079** and **083**) contained a small flint flake, which although undateable may point towards an earlier, prehistoric date to these features.

The function or date of the short gully (**066**) located to the directly to the south of the semi-circular gully (**028**) is unknown. However, a moderate amount of tap slag (94g) and ore (178g), along with a large amount of charcoal from hazel and oak trees, would suggest that it is contemporary with the metalworking features within the central area (see below section 9.5). Conversely, the lack of any slag within the fill of semi-circular gully (**028**), or within any of the features encompassed by it, would suggest that these features are of a different date.

Pit **017** was filled with a charcoal rich deposit (**018**), although there were no signs of in-situ burning which suggests that this was a deliberately dumped deposit rather than a burning event. The fairly loose nature of this deposit may also suggest a relatively modern date for this feature.

The two interconnecting shallow curvilinear gullies (**183** and **184**) uncovered on site may represent part of a field enclosure system that has been mostly ploughed out. A smaller linear feature (**197**) was revealed to the west of these gullies and given its similar form and fill then it is probable it is contemporary with these gullies. However, its different orientation and position in relation to these gullies would suggest that

either it formed part of a small sub-oval enclosure with gully **184** or that it had a different, unknown function to that of the gullies.

A large amount of slag and in-situ burning was visible within a spread (**260**) directly adjacent to the stone platform (**231**), as well as within small sub-circular pit **229**, all of which were located within a shallow depression (**228**). The slag within the spread was predominately flow slag, and contained the highest amount of this type of slag (2.3kg) than any other feature on site. Contrary to this, the slag within pit 229 consisted mostly of bog iron ore, again in the largest concentration (1.9kg) of any other feature uncovered on this site. This would suggest that smelting was taking place here, with the spread (260) representing the working floor. No evidence of burning was uncovered from the stone platform (**231**), suggesting that this was not directly used as a part of the metalworking activity, although its exact function is unclear. Further research into similar smelting work is needed so as to allow for a full interpretation and comparison.

The function of the large, circular posthole (**261**), which was also uncovered within the depression, to the southeast of pit **263**, is unknown. However, it may have been used to hang or hold something associated with the nearby metalworking. Similar single large postholes were uncovered adjacent to a number of pits containing slag across the site (see below section 9.5), which suggest a correlation between the two, although their exact function is unknown.

9.5 Area B Central Area

9.5.1 Area B Central Area - Sub-Concentration A

The date and function of the three postholes (**161**, **164**, and **175**), located in a roughly triangular shape, is unknown. However, due to their proximity with pit **172** and the other probable metalworking features to the north, then it is likely that they are contemporary, and may have formed a small stand.

Although the exact function of pit **172** is currently unknown, a mixture of tap, flow, and undiagnostic slag was recovered from its fill, suggesting that this feature was used during the smelting process, with the high concentration of stone also recovered from its fill part of this process as well. The adjacent pits (**166** and **170**) which showed evidence of in-situ burning are most likely also associated with the smelting process, as well as posthole **168**, which conforms to the pattern of a single posthole adjacent to a pit, seen throughout the site.

A mixture of flow slag and undiagnostic slag was recovered from two (**178** and **226**) of the three postholes which were located in a line, adjacent to three pits (**149**, **153**, and **155**). Two of these pits (**149** and **155**) also contained flow and undiagnostic slag, along with pit **141** directly to the east. Hammerscale was also recovered from a number of these features (**149**, **155**, and **178**), and this along with the slag recovered suggests that smithing was taking place within this area, although the exact function

of each of these features is currently unknown. Further research into similar smithing and smelting work is needed so as to allow for a full interpretation and comparison.

Pit **149** also contained a large collection of plant macrofossils (the second largest from the site), with over 100 unidentified cereal grains, over 500 oat/ grass grains, as well as a large amount of cereal chaff and weeds recovered from its fill. This concentration of plant macrofossils, along with the multiple thin burning layers visible at its base, suggest the pit may have been used for the charring of cereal grain, chaff, and crop weeds, and the waste used for fuel for the nearby smithing and smelting activities.

The purpose of the two postholes (**143** and **145**) located adjacent to pits **141** and **149** respectively is currently unknown. However, this pattern of a single posthole adjacent to a pit is repeated elsewhere on site, and further research into the metalworking process may shed light on their function.

9.5.2 Area B Central Area - Sub-Concentration B

The sub-rectangular hollow (**213**) was located on a natural slope, and it is likely that the southern and eastern sides were hand dug so as to create a fairly flat area with partial shelter towards these sides. The majority of features within this concentration were located within this hollow, suggesting that they are all fairly contemporary.

The stone hearth (**215**) was located at the northwestern end of the hollow (**213**), at its deepest point, where the most shelter would have been afforded. Over 100 hazelnut shells were recovered from the fill of the stone hearth, along with a couple of fragments of undiagnostic burnt bone. None of the hazelnut shells showed any marks commonly associated with processed shells, suggesting that they merely represent the use of hazel wood as fuel within the hearth rather than the use of the hazelnuts as a food source. The presence of charcoal from hazel, as well as willow and oak trees, suggests that a number of resources were being utilised as fuel for this hearth. Unlike the majority of features within this area, no metalworking residues were recovered from the hearth, with the exception of a small amount of concretion on a small, unidentified, iron artefact. It is therefore likely that this hearth was primarily used for heat, as well as possibly for a small amount of cooking, as evidenced by the burnt bone.

The adjacent stone platform (**232**) was located abutting up against the northwestern edge of the hearth (**215**) which suggests that the hearth was built earlier than the stone platform. However, given the lack of any evidence of burning or metalworking on the platform, then it is likely that this platform was not directly involved with the nearby metalworking activity, and therefore it may be contemporary with, and been used in conjunction with, the hearth, as a dry, sheltered place to rest. The stone platform (**232**) also sealed a large number of features (**211**, **219**, **240**, **242**, **244**, **247**, **250**,**252**, **254**, **258**, and **265**), the majority associated with the metalworking process (see below), which again suggests that the platform itself was not associated with

this process and was only built once these features had gone out of use, and the metalworking process moved elsewhere on site. Unlike the stone platform (**231**) uncovered to the east, this stone platform had no distinct edges, as well as a section of its middle removed. This would suggest that it was at least partially been removed, possibly to create the stone platform (**231**) to the east, when it went out of use.

The depth of circular pit (**222**); uncovered to the southwest of the stone platform (**232**); along with the lack of any fragments of slag or evidence of in-situ burning, suggests it may have been used for storage. The distinct lack of any slag fragments may also suggest that it is more broadly contemporary with the stone platform (**232**) and hearth (**215**), rather than the underlying metalworking features in the area.

The exact nature of the slightly curvilinear gully (**206**), which was located running downhill away from the northeastern edge of the shallow hollow (**213**), is unknown. However it may represent a drip gully, diverting water away from the metalworking features underneath the stone platform (see below). A small amount of flow and undiagnostic slag fragments were recovered from the fill of this gully, suggesting that it is contemporary with these metalworking features. It is also possible that it continued to be utilised after these features went out of use, continuing to divert water away from the hearth (**215**) and stone platform (**232**).

A total of eleven features (**211**, **219**, **240**, **242**, **244**, **247**, **250**, **252**, **258**, **254** and **265**), were visibly sealed by the stone platform (**232**), and it is most likely that pit/ gully **217** was also originally sealed by this platform given its location and the indistinct edges of the platform. The fills of half of these features (**211**, **217**, **219**, **240**, **244**, and **247**) were sampled and all of them contained smithing and smelting residues, with the fills of **211**, **217**, and **240** producing exceptionally high quantities (3.8kg, 5.6kg, and 1.6kg respectively). It is therefore likely that the majority of these features were used directly within the metalworking process, although their exact function within the process is currently unknown. Further research into similar smithing and smelting work is needed so as to allow for a full interpretation and comparison.

The exception to this is the group of three interconnecting postholes (**247**, **250**, and **252**) which were located directly to the northwest of hearth **215**. Their relationship with nearby hearth **215** is uncertain, however given their proximity to it, along with the lack of any other postholes nearby, then it is likely they are contemporary. This in turn would suggest that the hearth was in use both before and after the stone platform (**232**) was built. Given the similar nature of their fills it was impossible to tell which posthole truncated which, and given their close proximity it is likely that they were either contemporary, or represent the replacing of a post within the same are three times. The exact function of the postholes is unknown, but it is likely that they were used to hold something over or near to the hearth, rather than anything to do with the nearby metalworking process.

9.5.3 Area B Central Area - Outlying Features

Pits **124** and **126** were located directly to the north of the two main concentrations of features within this area, with the fills of both these features containing fragments of flow and undiagnostic slag, as well as burr, and in the case of pit **124**, 224g of possible smithing hearth cakes (SHC). This would suggest that these features are contemporary with, and associated with, the smithing and smelting features located directly to the south, most likely those within Sub-Concentration B (see above). However, their exact function is unknown and further research into similar smithing and smelting work is needed so as to allow for a full interpretation and comparison.

The remaining outlying features are all concentrated to the south/ southwest of the two main concentrations (see above). Minimal amounts of slag were recovered from the fills of the three linear features (**187**, **202**, and **204**). This would suggest that none of these features were used during the metalworking processes going on elsewhere on site, but that they were, at least broadly, contemporary and went out of use at the same time. Their function is currently unknown, however the linear features may have been used to demarcate a boundary, with the hollow possibly used for storage.

10 STATEMENT OF POTENTIAL

10.1 AREA A FEATURES

The probable field boundary ditch uncovered within this area may be shown on historic maps of the area, and an investigation of these should be made so as to possibly date this boundary. However, the boundary ditch, along with the post-medieval pit and stone spread are all of minor importance in understanding the landscape.

10.2 AREA B FEATURES

The substantial quantity of archaeometallurgical residues recovered from the majority of features within Area B indicates that there was smithing and smelting taking place in this area. The high concentration of cereal grains from two of the features also indicates that cereal processing was most likely being carried out. The similar features uncovered during the 2012-13 excavations at Cefn Graianog were dated to between the 7th and 9th centuries AD (GAT forthcoming), and dating of these features is essential so as to determine if they are contemporary, as well as to allow them to be placed within their proper setting. The presence of these features is of regional, if not national, importance in understanding the development of metalworking during the early medieval period in Wales. The dating of them will also allow for comparison with similar sites, so that a better understanding of the activity can be gained.

Two fragments of flint were recovered from two of the postholes enclosed by the semi-circular gully within the southeastern corner of the site. These flints, along with the fact that no archaeometallurgical residues were recovered from the gully or associated features, suggest that these features are of an earlier date. The 2012-13 excavations uncovered two pits to the southwest that have been dated to the Early Bronze Age (18th to 20th Century BC, GAT forthcoming), and it is possible that these features are contemporary. Dating of these features is therefore essential to determine if they are contemporary with the previously uncovered features. Dating will also allow them to be placed within their proper setting and allow for comparison with other similar sites, as well as aiding our understanding of the nature of these features.

10.3 ARTEFACTS

Iron Objects

A single iron nail was recovered from spread **228**. This nail has been assessed and no further work on it is recommended.

Stone Objects

One of the stone objects was deemed to be natural and will be discarded. The remaining four objects will be recorded photographically, but no other work is proposed for them.

10.4 ARCHAEOMETALLURGICAL RESIDUES

The material recovered is broadly similar to that found on the site previously. The evidence for the smelting technology is slightly ambiguous: it may represent a mixture of slag tapping and non-tapping technologies, or perhaps an early form of slag tapping with a rather low volume of tapped slag. Several of the pits are of similar size to known early slag tapping furnaces and are worthy of further investigation.

The evidence for the nature of the smithing being undertaken is largely from the microresidues, which suggest that working down to bar (or even perhaps to artefacts) was being undertaken on site. This is similar to the situation at South Hook (Crane & Murphy 2010), but differs from that commonly encountered in England where most smithing may have been undertaken at estate/manorial centres, rather than at the site of smelting. It is possible that an abundance of ore in the adjacent wetlands allowed the Cefn Graianog smelting settlement to be rather more permanent than typical.

Dating evidence from the 2013 season includes radiocarbon dates suggesting a date within the period of late 7th century to late 9th century AD. Sites in southern England and South Wales have been interpreted (e.g. Young 2015) as suggesting the replacement of slag pit furnaces by slag tapping in the late 9th to early 10th centuries.

The situation in North Wales is even more poorly evidenced than further south. The non-tapping furnaces of the later Iron Age have been well documented by Crew (Crew 1987, 1989, 1991, 1998, 2009), and similar furnaces appear to have been employed locally during the Roman period. These furnaces had an arch to facilitate hearth clearance/ repair (and possibly bloom removal). The furnaces are not recorded as possessing external working hollows (unlike other similar contemporary furnaces (e.g. Derrrinsallagh, Co. Laois, Ireland; Young 2008; Knockbrack, Co. Kerry, Ireland, Hull & Taylor 2006). Thus it is possible that North Wales maintained a native tradition of non-tapping furnaces through the Roman period, in contrast to areas further south and east in which the Iron Age style of furnace may have been entirely replaced by slag-tapping variants in the Roman period. The only early medieval smelting site described in any detail to date, is that at Borras Quarry (work ongoing), which has yielded slags suggestive of probable non-tapping furnaces.

The occurrence of flow slags with both dull and shiny surfaces, slag spheroids, charcoal-rich ferruginous sediments, fine lining debris and spiky ‘sinter’ (probably of fine slag and ore particles) can be most closely paralleled with finds inside abandoned furnaces on some Irish sites (e.g. Celbridge, Young 2003a), but somewhat similar fines assemblages have been found on some British Iron Age sites

(e.g. the northern furnaces at Twinyeo, Devon, Young 2013). The significance of the fine scale residues from the basal pits at these sites may be that smelting at these sites produced modest volumes of slag compared with the pit volume, and that the pit was sufficiently deep that its base lay well below the bloom and immediately associated slag.

At many sites, the non-tapped flow slag preserves moulds of the original pit/ chamber packing. Such a packing is usually of split wood (e.g. Carlin 2008; Rainbird & Young in press; Young 2003b) but is occasionally of cereal straws or grass (e.g. Mikkelsen 1997; Young 2015). The Cefn Graianog assemblage contains no material for which pit packing was identifiable. This may reflect the tendency of the assemblage to include only smaller slag particles, but might also be circumstantial evidence for the use of slag-tapping process.

The characteristics of the site, with evidence for multiple workshops mostly undertaking both iron smelting and smithing, suggest a settlement that is arguably in the tradition of the earlier iron-making settlements of Crawcwellt West (Crew 1989, 1998, 2009) and Bryn-y-castell (Crew 1987, 2009). Dating the ironworking activity of the various concentrations (presumably structures) will be important in determining their degree of contemporaneity.

Recommendations

The development of working floors has obscured the nature of the associated cut features; further work, through the interrogation of the field records and comparison with other sites, is required to increase understanding of the features.

The nature of the macroscopic residues as potential very early (for the early medieval) tapped slags gives their investigation a more than local significance. Indeed this stage of the development of the iron smelting process is under intense investigation elsewhere (e.g. Hemyock, Churchills Farm). The presence of collections of bog iron ore also give the assemblage significance, for the smelting residues should be able to be linked to the raw material.

The value of the collection is further raised by the presence of limited macro- and abundant micro- residues from smithing. The artefactual material from the site should be checked to see if it includes any metallic iron produced at the site.

With all these components to the residue assemblage and important style of working, it is recommended that a programme of further laboratory analysis is conducted to characterise the process and to permit modelling of the efficiency and yield of the smelting process.

The assemblage is one of regional and potentially national significance. It should therefore be deposited in its entirety with the site archive in an appropriate institution.

10.5 Environmental Data

Charcoal and other charred plant remains

The samples produced some environmental material of interpretable value. The deposits from which the samples derive, mainly represent the intentional deposition or accumulation of domestic waste associated with fires.

The fact that the samples have produced broadly similar results suggests that these secondary deposits do not result from deposition of debris from accidental charring events, but instead represent a consistent pattern of charring cereal grain, chaff and crop weeds over the period of occupation

Recommendations

It is recommended that a full analysis of the remains from context **122** and context **150** be carried out. This should include the sorting and full identification of the other half of the flot from Sample 9. Only half of this was used for the assessment of the environmental remains due to it being so rich in plant macrofossils. Some weed seeds which were present in several samples should also be identified.

It is also recommended that comparative data on both a local and national scale is sought to put the remains from this site into context with the wider area.

No further work is recommended on any of the other samples.

10.6 Dating

The only roughly datable finds recovered from the site were the secondary flint blade of probable Later Mesolithic or Early Neolithic date recovered from the subsoil and the single iron nail recovered from spread **228**, which may date from the Iron Age onwards. Dating is therefore a high priority, particularly as the site may have been in use during both the prehistoric and medieval periods, as suggested by the presence of the flint fragments and the dating of the features previously excavated in 2012-13.

Due to the scarcity of any datable finds from the site, the dating must therefore rely on radiocarbon dates produced from the charcoal, cereal grains, and hazelnut shells recovered from the samples. Two separate dates will be obtained from each feature to be dated. This is so as to obtain a more accurate date for the feature and reduce any possible error.

It is proposed to obtain dates from the fill of pit **120**. This would give us a date for the cereal processing that was taking place here and allow us to determine if it was contemporary with any of the metalworking features on site.

Further dates should also be obtained from pit **102** and spread **098**; pit **229** and spread **260**; pits **172** and **149**; and linear **217**, pit **240**, and hearth **215**. These dates would allow us to determine if the separate concentrations of features described

above, were contemporary, as well as aiding our interpretation and comparison of them.

It is also proposed to obtain dates from gullies **187** and **202** so as to dertmine if they are contemporary with the nearby metalworking features, and to aid us in our interpretation of their function.

Dates should also be obtained from semi-circular gully **028** and posthole **083**. This will allow us to establish if they are of prehistoric date and therefore possibly contemporary with the Early Bronze Age features uncovered in 2012-13.

The dating of all these features will help us to interpret their function and allow us to place them in context within the wider landscape.

A total of 28 dates are proposed on fourteen features. This will produce a fairly substantial suite of dates that will have to be compared to each other to judge which are contemporary and how long certain activities lasted. This comparison can be done by eye but this is inaccurate and not very rigorous. It is much preferable to use statistical methods to compare date; chi squared tests to see whether two dates from a feature are statistically indistinguishable, i.e. contemporary, or not, and Bayesian analysis to obtain durations of use of groups of features. It is therefore recommended that a specialist experienced in these techniques be employed to interpret the radiocarbon dates that are produced and ensure that the maximum information is obtained from them.

10.7 RECOMMENDATIONS

The site narrative will need expanding and the site needs to be discussed in its wider landscape context. The following tasks are recommended:

- Full appropriate drawings and photographs to accompany the narratives are necessary.
- No further study of the stone objects, although they will be recorded photographically and retained with the site archive.
- The natural stone will be discarded.
- The iron nail will be checked to see if it includes any metallic iron produced at the site.
- The archaeometallurgical residues will be compared with those from similar sites, both locally and nationally.
- Further laboratory analysis will be conducted to characterise the metalworking process and to permit modelling of the efficiency and yield of the smelting process.
- The smelting residues will be examined so as to establish their raw material.
- Full analysis of the remains from context **122** and context **150** will be carried out by Rosalind McKenna be carried out, as only half of these samples were assessed for this stage. The weed seeds will also be re-examined so as to identify each species present.
- Comparative data on the plant remains, on both a local and national scale will be examined by Rosalind McKenna, so as to put these remains into context within the wider area.
- The charcoal, cereal grains, and hazelnut shells will be assessed by Roaslind McKenna to determine their suitability for dating and a selection sent to SUREC for dating. A total of 28 dates from fourteen features is proposed. The selection details will be included in the updated project design.

An updated project design will be completed for **Phase 4: Analysis and report preparation** and **Phase 5: Dissemination** of **MAP 2**, as outlined in Section 1. An updated project design will be submitted along with this report.

11 ACKNOWLEDGEMENTS

The author would like to thank Ellesmere Sand & Gravel Co. Limited for commissioning the work and Huw Thomas for all his help on site. The work on site was carried out by Dave McNicol, Iwan Parry, Anne Marie Oates, and Neil McGuiness.

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APPENDIX I: PROJECT DESIGN

CEFN GRAIANOG QUARRY

PROJECT DESIGN FOR ARCHAEOLOGICAL CONTROLLED STRIP (G1598)

Prepared for

Ellesmere Sand & Gravel Co. Ltd.

JULY 2014

Ymddiriedolaeth Archaeolegol Gwynedd

Gwynedd Archaeological Trust

CEFN GRAIANOG QUARRY

PROJECT DESIGN FOR ARCHAEOLOGICAL CONTROLLED STRIP (G1598)
-

JULY 2014

Prepared for Ellesmere Sand & Gravel Co. Ltd.

CONTENTS

1. INTRODUCTION

Gwynedd Archaeological Trust (GAT) has been asked by *Ellesmere Sand & Gravel Co. Ltd* to provide a project design with costs for undertaking an archaeological controlled strip at the location of a proposed extraction area within Cefn Graianog Quarry during initial groundworks. The extraction area is located at NGR **SH45894982** (see Figure 01) and is divided into two areas:

- Area A – this measures 8,588m^2;
- Area B – this measures 9,987m^2

The current phase is scheduled from w/c 04/08/12 for a minimum of 3 weeks.

Area A is located to the immediate north of areas stripped in 2007 and to the east of an area stripped in 2012. The area stripped in 2007, to the south of Area A did not uncover anything of archaeological significance but additional work done in the same year uncovered a sub-circular ditch that was radio carbon dated to the 8th century AD (GAT report **724**). The area of the controlled strip in 2012 revealed evidence of field clearance and a number of pits and post holes of unknown date and function.

Area B is positioned to the immediate north of the controlled strip of 2012 as well as the sub-circular 8th century AD ditch, detailed above. To the east there was the controlled strip of 2013 which uncovered 19 features consisting of a concentration of stones, possible pits and post holes, and features associated with metalworking.

1.1 ARCHAEOLOGICAL BACKGROUND

The current mitigation programme forms part of a long-standing GAT project monitoring the extension of the quarry.

The original assessment of the quarry expansion area was undertaken in 1994 by GAT for *Tarmac Quarry Products Ltd.* (Flook 1994 GAT Report **124**) and this was followed by a series of watching briefs and archaeological evaluations to the east and south of the proposed area (see GAT Reports **344**, **424**, **505**, **530**, **549**, **676**, **724**, **811** & **901**).

The most recent phases of archaeological works included the evaluation in the location of a suspected medieval platform house in 2007 (GAT Report **724**) and the evaluation of a 0.8ha area to the immediate south of the current proposed area (GAT Report **811**). The stripping of a zone of similar size to the immediate east of the current area was completed in 2011 (see Figure 01 for location; GAT Report **901** and report forthcoming).

A suspected platform house was located at NGR SH46024978 and was identified in the original 1994 assessment as **Feature 09**. The platform house was not identified but a truncated sub-circular ditch was located within the evaluation area. The ditch was cut into the glacial horizon and measured 0.80m in width and covered an area *c*. 20.0m across. Two radiocarbon dates were obtained from samples recovered from the ditch fill (**KIA38220** and **KIA38219**). Both dates suggested a *terminus ante quem* within the 8th century AD (GAT report **724**). The provenance of this feature was unclear but the date range corresponded with the known evidence for resettlement of the area from the 8th century AD (GAT Report **124**: 4), as represented by the hut group at (NGR SH45504945; PRN 118), located *c.* 660.0m to the southwest. The truncated sub-circular ditch was located *c.* 40.0m to the west of the current extraction area (Figure 01).

Between the 12th of November and 4th of December 2012 an area measuring 4,046m², located at NGR SH45914977, was subject to a controlled strip which revealed evidence of field clearance and a number of pits and post holes of unknown date and function.

Between the 27th of August and the 4th of September 2013 an area measuring 6,758.3m², located at NGR SH46054985, was subject to a controlled strip which revealed 19 features consisting of concentration of stones, possible pits and post holes,

and features associated with metalworking. The post-excavation programme for the 2012 and 2013 controlled strips is currently underway (Parry, 1. 2014. GAT Report forthcoming).

These works will be monitored by Gwynedd Archaeological Planning Services (GAPS); the content of this design must be approved by GAPS in advance of works.

This design will conform to the guidelines specified in *Standard and Guidance for Archaeological Excavation* (Institute for Archaeologists, 1995, rev. 2001, 2008).

2. METHOD STATEMENT

2.1 INTRODUCTION

The extraction area is located at NGR **SH45894982** (see Figure 01) and is divided into two areas:

Area A – this measures 8,588m^2;

Area B – this measures 9,987m^2

The stripped topsoil will be loaded onto dumpers and stored in bunds. In Area A the bund will be located along the western boundary within a stripped area with the provision that the spoil will not be stored on top of any archaeological deposits. In Area B the bund will be positioned to the immediate north, on ground that will not be stripped in this phase of the groundworks.

A 13 tonne 360º tracked/crawler excavator with a 1.5m or 1.8m wide toothless bucket will be used.

The controlled strip is to be undertaken in a manner that allows for the immediate cessation of development for the recording of archaeological evidence. This will involve close liaison between the archaeologist and the site agent.

All machinery must avoid stripped areas until inspected and recorded by GAT personnel.

- All undifferentiated topsoil or overburden of recent origin will be removed down to the glacial horizon, in successive, level spits. All investigation of archaeological levels will be by hand, with cleaning, examination and recording both in plan and section. Spoil heaps will be monitored to recover artefacts to assist in the analysis of the spatial distribution of artefacts. Modern artefacts will be noted but not retained.

- Within significant archaeological levels a minimum number of features required to meet the aims will be hand excavated. Occasional pits and postholes will be subject to a 50% sample by volume. Complex clusters of pits will be sampled more selectively. Linear features will be sectioned as appropriate.

- The completed controlled strip zone and any identified archaeological features will be located and planned digital survey completed using a *Trimble R8 GNSS/R6/5800* GPS receiver.

- A written record of all identified features will be completed via GAT pro-formas

- All subsurface features will be recorded photographically using a digital SLR set to maximum resolution and completed in JPEG format.

- Any further mitigation required will be subject to an additional Further Archaeological Works Design (FAWD)

- Recourse to specialist input should be considered during fieldwork as well as during the post-excavation programme, to accommodate any

palaeoenvironmental, artefactual or other deposits or areas of archaeological significance identified during the course of the mitigation.

2.2 ENVIRONMENTAL SAMPLES

If encountered, relevant archaeological deposits will be sampled by taking bulk samples for flotation of charred plant remains. Bulk samples will be taken from waterlogged deposits for macroscopic plant remains. Other bulk samples, for example from middens, may be taken for small animal bones and small artefacts.

2.3 HUMAN REMAINS

If encountered, human remains will be left *in-situ*, covered and protected, and both the coroner and the GAPS Archaeologist informed. If removal is necessary it will take place under appropriate regulations and with due regard for health and safety issues. In order to excavate human remains, a licence is required under Section *25* of the Burials Act 1857 for the removal of any body or remains of any body from any place of burial. This will be applied for should human remains need to be investigated or moved.

2.4 SMALL FINDS

The vast majority of finds recovered from archaeological excavations comprise pottery fragments, bone, environmental and charcoal samples, and non-valuable metal items such as nails. Often many of these finds become unstable (i.e. they begin to disintegrate) when removed from the ground. All finds are the property of the landowner, however, it is Trust policy to recommend that all finds are donated to an appropriate museum where they can receive specialist treatment and study. Access to finds must be granted to the Trust for a reasonable period to allow for analysis and for study and publication as necessary. All finds would be treated according to advice provided within *First Aid for Finds* (Rescue 1999). Trust staff will undertake initial identification, but any additional advice would be sought from a wide range of consultants used by the Trust, including National Museums and Galleries of Wales at Cardiff and ARCUS at Sheffield.

Unexpected Discoveries: Treasure Trove

Treasure Trove law has been amended by the Treasure Act 1996. The following are Treasure under the Act:

- *Objects other than coins* any object other than a coin provided that it contains at least 10% gold or silver and is at least 300 years old when found.
- *Coins* all coins from the same find provided they are at least 300 years old when found (if the coins contain less than 10% gold or silver there must be at least 10. Any object or coin is part of the same find as another object or coin, if it is found in the same place as, or had previously been left together with, the other object. Finds may have become scattered since they were originally deposited in the ground. Single coin finds of gold or silver are not classed as treasure under the 1996 Treasure Act.
- *Associated objects* any object whatever it is made of, that is found in the same place as, or that had previously been together with, another object that is treasure.
- *Objects that would have been treasure trove* any object that would previously have been treasure trove, but does not fall within the specific categories given above. These objects have to be made substantially of gold or silver, they have to be buried with the intention of recovery and their owner or his heirs cannot be traced.

The following types of finds are not treasure:

- Objects whose owners can be traced.
- Unworked natural objects, including human and animal remains, even if they are found in association with treasure.
- Objects from the foreshore which are not wreck.

All finds of treasure must be reported to the coroner for the district within fourteen days of discovery or identification of the items. Items declared Treasure Trove become the property of the Crown, on whose behalf the National Museums and Galleries of Wales acts as advisor on technical matters, and may be the recipient body for the objects.

The National Museums and Galleries of Wales will decide whether they or any other museum may wish to acquire the object. If no museum wishes to acquire the object, then the Secretary of State will be able to disclaim it. When this happens, the coroner will notify the occupier and landowner that he intends to return the object to the finder after 28 days unless he receives no objection. If the coroner receives an objection, the find will be retained until the dispute has been settled.

2.5 FURTHER ARCHAEOLOGICAL WORKS

The identification of significant archaeological features during the watching brief may necessitate the production of a new project design and the submission of new cost estimates to the contractor.

The application of a further archaeological works design (FAWD) will be dependent on the initial identification, interpretation and examination of an archaeological feature and the establishment of a threshold of significance over which a FAWD might be triggered. This will include any features of demonstrable or likely prehistoric to medieval date and, for post-medieval features, any complex or unusual remains, including industrial activity. The requirement for an FAWD will be determined in conjunction with GAPS through established communication lines and the monitoring process.

The FAWD will be instigated through a GAT produced document that will include:

- feature specific methodologies;
- artefact and ecofact specialist requirements, with detail of appropriate sampling strategies and specialist analysis
- timings, staffing and resourcing.
- Additional costs

The FAWD document will need to be approved by the Denbighshire Archaeological Service.

This design does not include a methodology or cost for examination of, conservation of, or archiving of finds discovered during the watching brief, nor of any radiocarbon dates required, nor of examination of palaeoenvironmental samples. The need for these will be identified in the post-fieldwork programme (if required), and a new design will be issued for approval by the Denbighshire Archaeological Service.

2.6 MONITORING ARRANGEMENTS

- The Gwynedd Archaeological Planning Service will need to be informed of all start dates for the various elements of the scheme listed and of the subsequent progress and findings and enable discussion about the need or otherwise for FAWDs if features of potential archaeological significance are encountered.

3.0 POST-EXCAVATION PHASE

3.1 INTRODUCTION

If required, the management of the post-excavation phase will follow guidelines specified in *Management of Archaeological Projects* (English Heritage, 1991), and relevant guidelines from *Management of Research Projects in the Historic Environment* (English Heritage 2006). Five stages are specified:

- Phase 1: project planning
- Phase 2: fieldwork
- Phase 3: assessment of potential for analysis
- Phase 4: analysis and report preparation
- Phase 5: dissemination

The post-excavation stage for the project will include phases 3 to 5.

Phase 3 involves an objective assessment of the results of the fieldwork phases (Phases 1 and 2) in order to ascertain the appropriate level of post-excavation analysis and reporting. This phase culminates in the production of a post-excavation assessment report. The second involves carrying out the work identified within the post-excavation assessment report, and culminates in a final report and project archive (Phases 4 and 5).

3.2 POST-EXCAVATION ASSESSMENT

The level of post-excavation analysis and reporting for the purposes of the evaluation will be sufficient to establish the character, scale, date range, artefactual and palaeo-environmental potential and overall significance of the remains.

Style and format of the report will include as a minimum the following:

- A location plan
- Plans and sections of features located at an appropriate scale
- A section drawing showing depth of deposits including the present ground level with Ordnance Datum, vertical and horizontal scale.
- A summary statement of the results.
- A table summarising per trench the features, classes and numbers of artefacts contained within, spot dating of significant finds and an interpretation.
- An interpretation of the archaeological findings both within the site and within their wider landscape setting.

Artefact analysis will be sufficient to establish date ranges of archaeological deposits, a general assessment of the types of pottery and other artefacts to assist in characterising the archaeology, and to establish the potential for all categories of artefacts should further archaeological work be necessary.

3.3 ANALYSIS AND REPORT PREPARATION

The work undertaken during this phase of the project will be carried out according to the recommendations contained within the post-excavation assessment report.

3.4 PRODUCTION OF SITE ARCHIVE

A full archive including plans, photographs, written material and any other material resulting from the project will be prepared. All plans, photographs and descriptions will be labelled and cross-referenced, and lodged in an appropriate place (to be decided in consultation with the regional Sites and Monuments Record) within six months of the completion of the project. All digital data will be written to CD-ROM and stored with the paper archive.

4. STAFF & TIMETABLE

The project will be supervised by a senior member. The work will be undertaken by GAT personnel.

The work is scheduled from w/c 04/08/12 for a minimum of 3 weeks. Due to the size of the respective areas, 1No archaeologist will be required for Area A and 2No archaeologists for Area B. These areas will not be stripped concurrently and it is expected that Area A will be completed first.

5. HEALTH AND SAFETY

All GAT staff will be inducted onto site, and any risks and hazards will be indicated prior to the start of work via a submitted risk assessment. All staff will be issued with required personal safety equipment, including high visibility jacket, steel toe-capped boots and hard hat.

6. SOURCES CONSULTED

Davidson, A. and Roberts, J. 2004. Cefn Graianog Quarry Extension: Archaeological Evaluation and Watching Brief (G1598). GAT Report **549**

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Hopewell, D and Kenney J, 2003 Cefn Graianog Quarry Extension: archaeological watching brief (G1598), GAT Report **505**

Jones, S, 1999 Cefn Graianog Quarry Extension: archaeological watching brief (G1598), GAT Report **344**

Kenney, J 2001 Cefn Graianog Quarry Extension: archaeological watching brief (G1598), GAT Report **424**

Owen, K. 2010. Cefn Graianog Quarry Extension: Archaeological Watching Brief (G1598), GAT Report **901**

Rees, C. 2009. Watching Brief: Cefn Graianog Quarry (G1598), GAT Report **811**

Roberts, J. 2007. Cefn Graianog Quarry Extension: Archaeological Watching Brief (G1598), GAT Report **676**

Roberts, J. 2008. Cefn Graianog Quarry Extension: Archaeological Evaluation (G1598), GAT Report **724**

Smith, G. 2004. Cefn Graianog Quarry Extension: Archaeological Watching Brief, December 2003 to January 2004 (G1598), GAT Report **530**

APPENDIX II: CONTEXT REGISTER

Context No	Area	Type	Description
001	A	Pit	Post-medieval pit
002	A	Pit	Small sub-oval pit, 1.1x0.65x0.18m
003	A	Fill	Light brownish grey clayey silt, fill of [002]
004	A	Deposit	Concentration of stones, >10x3.2x0.45m
005	A	Deposit	Dark greyish black sandy clay - burnt bioturbation
006	A	Deposit	Concentration of stones, >57x27x0.45m
007	A	Ditch	Linear gully/ ditch >22x1.2x0.28m
008	A	Fill	Dark brownish grey clayey silt, fill of [007]
009	B	Field Boundary	Stone field boundary, 2.5m wide, 0.5m high
010	Void	Void	Void
011	B	Linear	Linear feature, 1.1x0.4x0.06m
012	B	Fill	Greyish white and orangey brown clayey sandy silt, fill of [011]
013	B	Posthole	Possible Posthole, 0.38x0.25x0.07m
014	B	Fill	Orangey brown clayey sand, fill of [013]
015	B	Linear	Linear feature, 2.27x0.4x0.28m
016	B	Fill	Greyish brown sandy silt, fill of [015]
017	B	Pit	Sub-rectangular pit, 0.73x0.65x0.11m
018	B	Fill	Black charcoal rich fill of [017]
019	B	Pit	Sub-circular pit, 0.3m in diameter, 0.18m deep
020	B	Fill	Greyish brown sandy silt, fill of [019]
021	B	Pit	Sub-rectangular pit, 0.79x0.7x0.2m
022	B	Fill	Greyish brown clayey silt, basal fill of [021]
023	B	Fill	Greyish brown sandy silt, upper fill of [021]
024	B	Pit	Rectangular pit, 0.41x0.36x0.15m
025	B	Fill	Brownish grey sandy silt, fill of [024]
026	B	Curvilinear	Short curvilinear feature, 1.36x0.66x0.16m
027	B	Fill	Greyish brown sandy silt, fill of [026]
028	B	Gully	Curvilinear gully, 12.65x0.54x0.18m
029	B	Pit	Possible small circular pit, 0.4x0.33x0.16m
030	B	Fill	Dark brownish grey clayey silt, fill of [029]
031	B	Pit	Possible small circular pit, 0.53x0.49x0.13m
032	B	Fill	Dark brownish grey clayey silt, fill of [031]
033	B	Stone hole	Sub-circular stone hole, 0.75x0.6x0.2m
034	B	Fill	Brownish grey sandy silt, fill of [033]
035	B	Pit	Possible small circular pit, 0.6x0.5x0.16m
036	B	Fill	Brownish grey sandy silt, fill of [035]
037	B	Pit	Small sub-circular pit, 0.85x0.8x0.3m
038	B	Fill	Brownish grey clayey silt, fill of [037]
039	B	Bioturbation	Bioturbation, 0.8x0.4x0.15m
040	B	Fill	Dark orangey brown clayey silt, fill of [039]
041	B	Pit/ bioturbation	Possible sub-circular/ irregular pit, 0.5x0.4x0.09m
042	B	Fill	Black, orangey brown sandy silt, fill of [041]
043	B	Pit/ spread	Unexcavated pit/ spread
044	B	Fill	Unexcavated fill of [043]
045	B	Pit	Possible small oval pit, 0.6x0.35x0.08m
046	B	Fill	Mottled dark orangey grey clayey silt, fill of [045]
047	B	Pit	Small sub-oval pit, 0.46x0.36x0.1m
048	B	Fill	Mottled greyish brown and greyish white sandy silt, fill of [047]
049	B	Linear	Linear feature, 1.9x0.27x0.09m
050	B	Fill	Light greyish brown and greyish white sandy silt, fill of [049]
051	B	Linear	Linear feature, 2.2x0.35x0.12m

052	B	Fill	Light greyish brown sandy silt, fill of [051]
053	B	Pit	Oval pit, 1.1x0.6x0.17m
054	B	Fill	Mottled dark-mid orangey greyish brown sandy silt, fill of [053]
055	B	Pit	Sub-circular pit, 1.6x0.9x0.2m
056	B	Fill	Dark orangey brown clayey silt, fill of [055]
057	B	Ditch	Linear ditch, >45x1x0.3m
058	B	Fill	Reddish brown sandy silt, main fill of [057]
059	B	Fill	Light reddish brown sandy silt, basal fill of [057]
060	B	Void	Void
061	B	Void	Void
062	B	Void	Void
063	B	Void	Void
064	B	Ditch	Linear ditch, >9.25x1.6x0.2m
065	B	Fill	Brownish grey clayey silt and stone/ gravel, fill of [064]
066	B	Gully	Slightly curvilinear gully, 6.5x0.5x0.25m
067	B	Fill	Dark brownish grey clayey silt, fill of [066]
068	B	Pit	Sub-circular pit, 2.1x1.4x0.82m
069	B	Fill	Grey clayey silt, fill of [068]
070	B	Stone hole	Stone hole, 1.4x1.2x0.35m
071	B	Fill	Light brownish grey silt, fill of [070]
072	B	Pit	Sub-rectangular pit, 2.1x1.4x0.42m
073	B	Fill	Grey clayey silt, main fill of [072]
074	B	Fill	Mottled light greyish brown gravel, fill of [072]
075	B	Pit	Possible sub-circular pit, 1.36x0.87x0.38m
076	B	Fill	Greyish brown sandy silt, fill of [075]
077	B	Posthole	Oval posthole, 0.34x0.3x0.2m
078	B	Fill	Light greyish brown sandy silt, fill of [077]
079	B	Posthole	Oval posthole, 0.59x0.51x0.29m
080	B	Fill	Mid-light greyish brown sandy silt, fill of [079]
081	B	Stone hole	Stone hole, 1.03x0.9x0.4m
082	B	Fill	Mid-light greyish brown sandy silt, fill of [081]
083	B	Posthole	Circular posthole, 0.3m diameter, 0.29m deep
084	B	Fill	Greyish orangey brown sandy silt, fill of [083]
085	B	Posthole	Possible shallow oval posthole, 0.4x0.33x0.12m
086	B	Fill	Greyish brown sandy silt, fill of [085]
087	B	Stone hole	Stone hole, 0.64x0.43x0.23m
088	B	Fill	Greyish brown sandy silt, fill of [087]
089	B	Posthole	Sub-circular posthole, 0.49x0.42x0.29m
090	B	Fill	Light greyish brown sandy silt, fill of [089]
091	B	Posthole	Sub-circular posthole, 0.43x0.31x0.29m
092	B	Fill	Light greyish brown sandy silt, fill of [091]
093	B	Fill	Greyish brown sandy silt, fill of [028]
094	B	Pit	Sub-rectangular pit, 0.52x0.48x0.06m
095	B	Fill	Greyish brown sandy silt, fill of [094]
096	B	Stone hole	Stone hole, 0.54x0.38x0.16m
097	B	Fill	Greyish orangey brown sandy silt, fill of [096]
098	B	Spread	Black clayey silt deposit/ in-situ burning, 1.25x1.1x0.05m
099	B	Spread	Black clayey silt deposit, 1.5x1.3x0.05m
100	B	Pit	Sub-rectangular pit, 0.55x0.35x0.28m
101	B	Fill	Greyish black stony clayey silt, fill of [100]
102	B	Pit	Sub-oval pit, 1x0.75x0.4m
103	B	Fill	Greyish black clayey silt, main fill of [102]
104	B	Fill	Base stones within pit [102]
105	B	Pit	Sub-oval pit, 1.05x0.65x0.22m
106	B	Fill	Mottled grey and reddish brown clayey sand, top fill of [105]
107	B	Fill	Black clayey silt, in-situ burning layer within pit [105]

108	B	Fill	Concentration of stones at base of pit [105]
109	B	Stone hole	Stone hole, 0.65x0.65x0.35m
110	B	Fill	Light brownish grey clayey silt, fill of [109]
111	B	Posthole	Possible sub-oval posthole, 0.26x0.18x0.1m
112	B	Fill	Black clayey silt, fill of [111]
113	B	Fill	Light greyish brown clayey silt, fill of [072]
114	B	Stone hole	Stone hole/ burrow, 1.09x0.48x0.33m
115	B	Fill	Greyish orangey brown sandy silt, fill of [114]
116	B	Posthole	Possible sub-oval posthole, 0.36x0.24x0.11m
117	B	Fill	Black clayey silt, fill of [116]
118	B	Posthole	Small circular posthole, 0.18m diameter, 0.08m deep
119	B	Fill	Black clayey silt, fill of [118]
120	B	Pit	Shallow sub-oval pit, 2.2x1.2x0.23m
121	B	Fill	Greyish brown clayey silt, top fill of [120]
122	B	Fill	Black clayey silt, in-situ burning within pit [120]
123	B	Fill	Greyish brown sandy silt, upper fill of [081]
124	B	Pit	Sub-circular pit, 0.9x0.85x0.32m
125	B	Fill	Greyish black clayey silt and stone, fill of [124]
126	B	Pit	Sub-rectangular pit, 1.35x0.6x0.19m
127	B	Fill	Blackish grey clayey silt, fill of [126]
128	B	Fill	Mottled light grey and greyish brown sandy silt, upper fill of [075]
129	B	Pit	Sub-circular pit, 0.6x0.45x0.22m
130	B	Fill	Light brownish grey silt, fill of [129]
131	B	Pit	Possible sub-rectangular pit, 1.5x1.35x0.11m
132	B	Fill	Brownish grey sandy silt, fill of [131]
133	B	Spread	Brownish grey sandy silt deposit
134	B	Posthole	Circular posthole, 0.25m diameter, 0.35m deep
135	B	Fill	Brownish grey sandy silt, fill of [134]
136	B	Posthole	Possible sub-circular posthole, 0.2x0.17x0.1m
137	B	Fill	Brownish grey sandy silt, fill of [136]
138	B	Posthole	Possible sub-circular posthole, 0.23x0.18x0.1m
139	B	Fill	Brownish grey sandy silt, fill of [138]
140	B	Fill	Mottled orangey brown and greyish brown sandy silt, fill of [089]/[091]
141	B	Pit	Sub-rectangular pit, 1.2x1.1x0.32m
142	B	Fill	Brownish grey clayey silt, fill of [141]
143	B	Posthole	Circular posthole, 0.23m diameter, 0.23m deep
144	B	Fill	Brownish grey clayey silt, fill of [143]
145	B	Posthole	Circular posthole, 0.19x0.16x0.19m
146	B	Fill	Brownish grey clayey silt, fill of [145]
147	B	Void	Void
148	B	Fill	Pale grey clayey loam, fill of [149]
149	B	Pit	Sub-rectangular pit, 1.75x0.95x0.28m
150	B	Fill	Mottled grey and black clayey silt, in-situ burning within pit [149]
151	B	Posthole	Circular posthole, 0.25m diameter, 0.2m deep
152	B	Fill	Greyish brown clayey silt, fill of [151]
153	B	Pit	Sub-rectangular pit, 0.6x0.45x0.2m
154	B	Fill	Greyish black clayey silt, fill of [153]
155	B	Pit	Sub-rectangular pit, 0.6x0.45x0.14m
156	B	Fill	Greyish black clayey silt, fill of [155]
157	B	Posthole	Possible circular posthole, 0.18x0.14x0.14m
158	B	Fill	Grey clayey silt, fill of [157]
159	B	Pit	Possible sub-oval pit, 0.65x0.35x0.1m
160	B	Fill	Grey clayey silt, fill of [159]
161	B	Posthole	Circular posthole, 0.28m diameter, 0.16m deep
162	B	Fill	Brownish grey clayey silt, fill of [161]
163	B	Fill	Greyish brown silt and gravel, post packing fill of [161]

164	B	Posthole	Circular posthole, 0.28x0.25x0.2m
165	B	Fill	Brownish grey clayey silt, fill of [164]
166	B	Pit/ Scoop	Sub-oval pit/ scoop, 0.35x0.25x0.05m
167	B	Fill	Black clayey silt, in-situ burning within pit/ scoop [166]
168	B	Posthole	Circular posthole, 0.22x0.2x0.28m
169	B	Fill	Brownish grey clayey silt, fill of [168]
170	B	Pit/ Scoop	Sub-oval pit/ scoop, 0.4x0.3x0.07m
171	B	Fill	Black clayey silt, in-situ burning within pit/ scoop [170]
172	B	Pit	Sub-square pit, 1.1x0.93x0.32m
173	B	Fill	Brownish grey clayey silt and stone, upper fill of [172]
174	B	Fill	Mottled grey and brown silt, basal fill of [172]
175	B	Posthole	Circular posthole, 0.2m diameter, 0.14m deep
176	B	Fill	Light brownish grey clayey silt, fill of [175]
177	B	Void	Void
178	B	Posthole	Circular posthole, 0.21x0.18x0.35m
179	B	Fill	Greyish brown clayey silt, fill of [178]
180	B	Spread	Greyish brown clayey silt deposit
181	B	Pit	Sub-square pit, 0.55x0.55x0.22m
182	B	Fill	Light brownish grey clayey silt, fill of [181]
183	B	Gully/ Ditch	Linear gully/ ditch, 8x0.51x0.09m
184	B	Gully/ Ditch	Curvilinear gully/ ditch, 13x0.33x0.08m
185	B	Fill	Greyish brown sandy silt, fill of [183]
186	B	Fill	Greyish brown sandy silt, fill of [184]
187	B	Gully	Small curvilinear gully, 5x1x0.34m
188	B	Fill	Mottled grey and brown clayey sand, fill of [187]
189	B	Pit	Sub-circular pit, 0.5x0.35x0.13m
190	B	Fill	Brownish grey clayey silt, fill of [189]
191	B	Void	Void
192	B	Void	Void
193	B	Void	Void
194	B	Void	Void
195	B	Void	Void
196	B	Void	Void
197	B	Linear	Linear feature, 4.7x0.61x0.14m
198	B	Fill	Greyish orangey brown sandy silt, fill of [197]
199	B	Spread	Light-mid greyish brown clayey silt deposit
200	B	Pit/ Posthole	Sub-circular pit/ posthole, 0.5x0.45x0.25m
201	B	Fill	Light-mid greyish brown clayey silt, fill of [200]
202	B	Gully	Linear gully, 4.6x0.55x0.16m
203	B	Fill	Light-mid greyish brown clayey silt, fill of [202]
204	B	Curvilinear	Slightly curvilinear gully, 7.3x0.45x0.16m
205	B	Fill	Mid-dark grey silty sand, fill of [204]
206	B	Gully	Linear gully, 3.4x0.55x0.16m
207	B	Fill	Greyish brown gravelly clayey silt, fill of [206]
208	B	Scoop/ hollow	Irregular scoop/ hollow, 3.5x2.5x0.1m
209	B	Fill	Dark brownish black sandy silt, fill of [208]
210	B	Spread	Dark brownish black deposit
211	B	Gully	Linear gully, 3.5x0.5x0.2m
212	B	Fill	Black clayey silt, fill of [211]
213	B	Hollow	Sub-rectangular hollow, 6.7x4.4x0.35m
214	B	Fill	Brown clayey silt, fill of [213]
215	B	Structure	Stone hearth, 1.15x0.7x0.2m
216	B	Fill	Black silt, in-situ burning within stone hearth [215]
217	B	Gully/ Pit	Curvilinear gully/ pit, 1.8x0.45x0.25m
218	B	Fill	Black silt and stone, fill of [217]
219	B	Pit	Sub-oval pit, 1.75x1.1x0.2m

220	B	Fill	Greyish brown clayey silt, upper fill of [219]
221	B	Fill	Black clayey silt, main fill of [219]
222	B	Posthole/ Pit	Circular posthole/ pit, 0.55x0.47x0.55m
223	B	Fill	Greyish brown silt and gravel, fill of [222]
224	B	Stakehole	Possible circular stakehole, 0.07m diameter, 0.05m deep
225	B	Fill	Dark greyish black clayey silt, fill of [224]
226	B	Posthole	Circular posthole, 0.21m diameter, 0.3m deep
227	B	Fill	Greyish brown clayey silt, fill of [226]
228	B	Spread	Dark brown sandy silt deposit
229	B	Pit	Sub-rectangular pit, 0.45x0.28x0.2m
230	B	Fill	Black silt and burnt stone, fill of [229]
231	B	Structure	Stone platform, 3.4x0.9x0.2m
232	B	Structure	Stone platform, 4.2x3x0.3m
233	B	Spread	Dark greyish brown deposit
234	B	Void	Void
235	B	Void	Void
236	B	Slope	Slope, >26m long, >3.2m wide, >0.4m deep
237	B	Fill	Black stony silt, fill of [234]
238	B	Pit	Irregular pit, 1.15x0.5x0.21m
239	B	Fill	Black silt and burnt stone, fill of [238]
240	B	Pit	Rectangular pit, 1.15x0.45x0.27m
241	B	Fill	Dark brownish grey clayey silt, fill of [240]
242	B	Pit	Rectangular pit, 1.1x0.5x0.24m
243	B	Fill	Brownish grey clayey silt, fill of [242]
244	B	Pit	Sub-rectangular pit, 1.5x0.35x0.5m
245	B	Fill	Same as [221]
246	B	Fill	Greyish brown and black clayey silt, fill of [244]
247	B	Posthole	Circular posthole, 0.25m diameter, 0.24m deep
248	B	Fill	Greyish brown clayey silt and gravel, fill of [247]
249	B	Fill	Stone packing within posthole [247]
250	B	Posthole	Circular posthole, 0.22m diameter, 0.2m deep
251	B	Fill	Greyish brown clayey silt and gravel, fill of [250]
252	B	Posthole	Circular posthole, 0.25m diameter, 0.22m deep
253	B	Fill	Greyish brown clayey silt and gravel, fill of [252]
254	B	Stakehole	Circular stakehole, 0.1m diameter, 0.2m deep
255	B	Fill	Dark blackish grey clayey silt, fill of [254]
256	B	Fill	Black clayey silt, fill of [265]
257	B	Fill	Brownish red burnt clay and silt, in-situ burning within pit [219]
258	B	Posthole	Circular posthole, 0.35x0.3x0.35m
259	B	Fill	Brownish grey clayey silt, fill of [258]
260	B	Spread	Black clayey silt deposit
261	B	Posthole	Circular posthole, 0.3x0.25x0.35m
262	B	Fill	Dark grey clayey silt, fill of [261]
263	B	Pit	Irregular pit, 1x0.5x0.05m
264	B	Fill	Greyish black clayey silt, fill of [263]
265	B	Posthole	Possible circular posthole, 0.2m diameter, 0.06m deep
266	B	Layer	Topsoil
267	B	Layer	Subsoil
268	B	Layer	Natural

APPENDIX III: PALAEOENVIRONMENTAL ASSESSMENT REPORT

An investigation into the palaeoenvironmental potential of samples originating from land at Cefn Graianog Quarry (Project Number G1598)

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Introduction

An archaeological excavation was carried out by Gwynedd Archaeological Trust (GAT) at Cefn Graianog, centred on NGR SH 4589 4982, between September and October 2014. Excavations revealed numerous archaeological features including a possible ring gully and multiple burnt pits, presumed to be associated with metalworking due to the high concentration of slag visible.

A programme of soil sampling was implemented during the excavation, which included the collection of soil samples from sealed contexts. The aim of the sampling was:

- To assess the type of preservation and the potential of the biological remains
- To record any human activities undertaken on the site – both domestic and industrial
- To provide information on the past environment of the area
- To establish a date for the activity carried out at the site.

Methods

Following selection, subsamples of raw sediment from the selected samples were processed. The samples were examined in the laboratory, where they were described using a pro forma. The subsamples were processed by staff at Brython Archaeology using their standard water flotation methods.

The flot (the sum of the material from each sample that floats) was sieved to 0.5mm and air dried. The heavy residue (the material which does not float) was not examined, and therefore the results presented here are based entirely on the material from the flot. The flot was examined under a low-power binocular microscope at magnifications between x12 and x40.

A four point semi quantitative scale was used, from '1' – one or a few specimens (less than an estimated six per kg of raw sediment) to '4' – abundant remains (many specimens per kg or a major component of the matrix). Data were recorded on paper and subsequently on a personal computer using a Microsoft Access database.

Identification was carried out using published keys (Jacomet 2006, Biejerinkc 1976, Jones – unpublished and Zohary & Hopf 2000), online resources (http://www.plantatlas.eu/za.php), the authors own reference collection. The full

species list appears in Table 1 at the end of this report. Taxonomy and nomenclature follow Stace (1997).

The flot was then sieved into convenient fractions (4, 2, 1 and 0.3mm) for sorting and identification of charcoal fragments. Identifiable material was only present within the 4 and 2mm fractions. A random selection of ideally 100 fragments of charcoal of varying sizes was made, which were then identified. Where samples did not contain 100 identifiable fragments, all fragments were studied and recorded. Identification was made using the wood identification guides of Schweingruber (1978) and Hather (2000). The full species list appears in Table 2 at the end of this report.

Taxa identified only to genus cannot be identified more closely due to a lack of defining characteristics in charcoal material.

Results

Forty one samples are the basis of this investigation. A list of these can be seen in Table 3 at the end of this report. Charred plant macrofossils were present in twenty five of the samples. The results of the plant macrofossil analysis can be seen in Table 1 below. The preservation of the charred remains varied from sample to sample. Where abundant remains were present within a sample the preservation also varied from poor to very good.

Indeterminate cereal grains were recorded in nineteen of the samples. These were identified based on their overall size and morphological characteristics, which may suggest a high degree of surface abrasion on the grains, indicative of mechanical disturbances that are common in features such as pits, post holes, gullies and ditches, where rubbish and waste are frequently discarded. Identified cereal grains were recovered in the form of wheat (*Triticum* sp.), barley (*Hordeum* sp.) and oat (*Avena* sp.) grains. These were probable identifications based on overall size and morphological characteristics. Oat awn fragments were also present in three samples. Probable oat floret bases were present in a single sample (Sample 9) and further analysis of these may be able to identify if the oats were of the cultivated variety. There were only a small number of identifiable grains of barley and wheat grains recorded, so other than to state their presence within the samples, little of further interpretative value can be gained. Further analysis of the samples may indicate a significant number of oat grains, however until this has been carried out only a small number of confirmed identifications are possible.

Another, more indirect, indicator of cereals being used on site is the number of remains of arable weeds that were found in twenty two of the samples. These weeds are generally only found in arable fields, and are doubtless incorporated into domestic occupation samples with crop remains. Along with grasses (POACEAE) which were present in twenty two of the samples, remains of knotgrass (Polygonum), docks (Rumex), and cleavers (Galium aparine) also fall in this group. All these species would almost certainly have been brought to the site together with harvested cereals.

Nineteen of the samples produced remains of hazel nut shell fragments. Hazel-nuts are valuable nutritionally, as well as being readily available. In addition, the nut shell is hard and resistant to decay ensuring its survival in some quantities. The hazelnut

shells recovered are indicative of a food source being consumed, perhaps as a snack and their husks being added to the fires as a method of waste disposal.

Twenty two of the samples produced small suites of plant macrofossils, both in terms of quantity and diversity. Due to this fact, other than to state their presence in the samples, nothing of further interpretable value can be gained. One of the samples (Sample 28) produced a medium sized suite of remains, in terms of quantity but not diversity. This sample was dominated by over 100 hazel nut shell fragments, together with a small number of grass and indeterminate cereal grains.

Two of the samples produced large suites of remains in terms of quantity and diversity. Sample 9 (122) came from a pit fill [120]. Over 3000 indeterminate cereal / grass grains were recorded, together with a suite of over one hundred unidentified weed seeds and a large amount of cereal chaff fragments. Sample 35 (150) from a pit [149] also produced an abundant suite of remains both in volume and diversity. Over 100 unidentified cereal grains were present within the sample, along with over five hundred oat / grass grains. A large amount of cereal chaff was also present within the sample, alongside weeds typically associated with cultivation such as docks, cleavers and knotgrass.

If cereal processing were occurring at the site, it would be expected that some remains (most probably in high numbers) of cereal chaff – a by-product of the crop processing sequence as stated in Hillman (1981; 1984) would be found. There was chaff present in five of the samples, but only in small amounts in comparison to the amount of grains recorded in three of the samples. Two of the samples did contain large amounts of chaff.

The results from the samples studied show a consistent pattern for deposition of crop processing debris. Two explanations for this pattern in the data are possible:

1. Semi clean grain (i.e. grain which was largely separated from its surrounding cereal chaff, and has been fine sieved but still includes larger sized weeds from the crops) was parched first before removing any remaining crop contaminants. These deposits could represent that proportion of parched crops which was charred during parching and then discarded.
2. Both crop processing waste (chaff and weed contaminants) which was burned as fuel, and charred cereal grain, possible resulting from parching before milling, were discarded into the same features, resulting in the mixtures of cereal grain, chaff and weeds of crop encountered.

The fact that the samples have produced broadly similar results suggests that these secondary deposits do not result from deposition of debris from accidental charring events, but instead represent a consistent pattern of charring cereal grain, chaff and crop weeds over the period of occupation and using the waste for fuel.

Charcoal fragments were present in nearly all of the samples, scoring between a ‘1’ and ‘4’ on the semi quantitative scale. The preservation of the charcoal fragments was generally poor to average. Where fragments were large enough, the majority enabled easy fracturing which revealed the identifying morphological characteristics. Where some of the fragments were poorly preserved, the fragments could be brittle, and the material crumbled or broke in uneven patterns making the identifying characteristics

difficult to distinguish and interpret. Identifiable remains were however present in thirty eight of the samples. The results of this analysis can be seen in Table 2 below.

The total range of taxa comprises oak (Quercus), willow/poplar (Salix/Populus), ash (Fraxinus excelsior) and hazel (Corylus avellana). These taxa belong to the groups of species represented in the native British flora. A local environment with an oak dominant woodland is indicated from the charcoal of the site. As seen in Table 2, oak was the most abundant and frequently recorded species within the samples, with hazel and willow/poplar being recorded in a significant number of samples, and ash recorded in a few samples. It is possible that these were the preferred fuel woods obtained from a local environment containing a broader choice of species.

All of the samples produced varying but small amounts of charcoal. The compositions of the samples are all similar, it is probable therefore that these small assemblages of charcoal remains reflect the intentional deposition or accumulation of domestic waste.

Generally, there are various, largely unquantifiable, factors that effect the representation of species in charcoal samples including bias in contemporary collection, inclusive of social and economic factors, and various factors of taphonomy and conservation (Thiery-Parisot 2002). On account of these considerations, the identified taxa are not considered to be proportionately representative of the availability of wood resources in the environment in a definitive sense, and are possibly reflective of particular choice of fire making fuel from these resources.

Conclusion

The samples produced some environmental material of interpretable value, with the plant macrofossils from twenty five samples, and the identifiable charcoal remains from thirty eight of the samples. The deposits from which the samples derive, mainly represent the intentional deposition or accumulation of domestic waste associated with fires.

The remains of plant macrofossils recovered from the samples showed the utilisation of wheat, barley, and oat as well as indeterminate cereal grains, and chaff fragments, together with a range of weed seeds typically associated with cultivation. Hazel nuts were also present within the samples. The hazelnut shells recovered may be indicative of a food source being consumed, perhaps as a snack and their husks being added to the fires as a method of waste disposal. However, the hazelnut shell fragments show no marks typically associated with processed shells. Together with the high portion of hazel charcoal, this may indicate that they are merely representative of hazel wood trees being burnt, which could be either a natural or a man-made process.

The fact that the samples have produced broadly similar results suggests that these secondary deposits do not result from deposition of debris from accidental charring events, but instead represent a consistent pattern of charring cereal grain, chaff and crop weeds over the period of occupation

In terms of taphonomy, it is likely that the samples from pits, postholes, gullies, ditches, all represent secondary deposition of charred plant remains. This probably occurred through intentional dumping. The use of cereal processing waste as fuel is

well attested (Hillman 1981; 1984) and disposal of spent fuel either into features such as pits or ditches/gullies or directly dumped onto the site seems a likely explanation for the arrival of this material on site. As the majority of the plant remains were found together with charcoal remains, it may suggest that waste or spilt grain were put on the fire with other rubbish and a small fraction became charred without burning up, and joined the domestic ash on the rubbish heap. It is possible that charred debris from cereal crop parching, possibly also in combination with other crop processing waste used as fuel, was redeposited in the features. Intentional dumping of charred debris (such as spent fuel, charred debris from parched crops etc.) seems the most likely explanation for the formation of the majority of the deposits encountered here. The evidence from the cremation features, shows that oak and ash was used during the cremation process, which is the standard fuel wood used.

The charcoal remains showed the exploitation of a several species native to Britain. Oak has good burning properties and would have made a fire suitable for most purposes (Edlin 1949). Oak is a particularly useful fire fuel as well as being a commonly used structural/artefactual wood that may have had subsequent use as a fire fuel (Rossen and Olsen 1985. Willow/Poplar are species that are ideal to use for kindling. They are anatomically less dense than for example, oak and ash and burn quickly at relatively high temperatures (Gale & Cutler 2000, 34, 236, Grogan *et al.* 2007, 29-31). This property makes them good to use as kindling, as the high temperatures produced would encourage the oak to ignite and start to burn. Hazel is recorded as a good fuel wood and was widely available within oak woodlands, particularly on the fringes of cleared areas (Grogan *et al.* 2007, 30). Ash is strong and tough, and makes excellent firewood producing both heat and flame. It will also burn when green (Grogan et al. 2007, 30).

Dryland wood species indicates the presence of an oak-ash woodland close to the site. This would have consisted of oak, which would be the dominant large tree species (Gale & Cutler 2000, 120, 205). The evidence of carr fen woodland indicates a damp environment close to the site. This type of woodland would have consisted of willow and poplar which are all trees that thrive in waterlogged and damp soils, particularly in areas close to streams or with a high water table (Stuijts 2005, 143 and Gale & Cutler 2000).

As asserted by Scholtz (1986) cited in Prins and Shackleton (1992:632), the “Principle of Least Effort” suggests that communities of the past collected firewood from the closest possible available wooded area, and in particular the collection of economically less important kindling fuel wood (which was most likely obtained from the area close to the site).

It is thought to be problematic using charcoal and plant macrofossil records from archaeological sites, as they do not accurately reflect the surrounding environment. Wood was gathered before burning or was used for building which introduces an element of bias. Plant remains were also gathered foods, and were generally only burnt by accident. Despite this, plant and charcoal remains can provide good information about the landscapes surrounding the sites presuming that people did not travel too far to gather food and fuel.

Recommendations

The samples have been assessed, and interpretable data has been retrieved and is the basis of this report. It is recommended that a full analysis of the remains from sample 9 (122) [120] and sample 35 (150) [149] be carried out. This should include the sorting and full identification of the other half of the flot from Sample 9. Only half of this was used for the assessment of the environmental remains due to it being so rich in plant macrofossils. Some weed seeds present in several samples were also not identified due to the fact this is an assessment stage and their identification would have taken more time. It is also recommended that comparative data on both a local and national scale is sought to put the remains from this site into context with the wider area. No further work is required on any of the other samples. Any material recovered by further excavations should be processed to 0.3mm in accordance with standardised processing methods such as Kenward *et al.* 1980, and the English Heritage guidelines for Environmental Archaeology.

Archive

All extracted fossils and flots are currently stored with the site archive in the stores at Gwynedd Archaeological Trust, along with a paper and electronic record pertaining to the work described here.

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Table 1: **Plant Macrofossils -** *Complete list of taxa recovered from excavations at land at Cefn Graianog Quarry (G1598)*
Taxonomy and Nomenclature follow Stace (1997).

Sample Number	**3**	**9**	**10**	**11**	**12**	
Feature Number	**66**	**120**	**79**	**77**	**28**	
Context Number	**67**	**122**	**80**	**78**	**93**	
Feature Type	**Gully**	**Pit**	**Post hole**	**Post hole**	**Gully**	
LATIN BINOMAL						**COMMON NAME**
Corylus avellana shell fragments		6	5	2	1	Hazel nut shell fragments
Polygonum spp.				1		Knotgrasses
Rumex L. spp.		3				Dock
POACEAE	19	2000+	5			Grass
cf. *Avena* spp.	1					Probable Oat
cf. *Aven* spp. floret bases		47				Probable oat floret bases
Avena spp. awns		9				Oats awns
Hordeum spp.	1					Barley
cf. Hordeum spp. rachis fgt.		1				Possible Barley rachis fgt.
Triticum spp.	2					Wheat
Indeterminate Cereal	7	1000+	2	3		Indeterminate Cereal
Unidentified Cereal culm nodes		144				Unidentified Cereal culm nodes
Unidentified Cereal rachis segment fgts.		4				Unidentified Cereal rachis segment fgts.
Unidentified Cereal rachis internodes		1				Unidentified Cereal rachis internodes
Indeterminate Cereal chaff fragments	3					Indeterminate Cereal chaff fragments
Indeterminate Cereal detached embryo		4				Indeterminate Cereal detached embryo
Unidentified		100+		1		Unidentified

Sample Number	**13**	**15**	**17**	**18**	**19**	
Feature Number	**89**	**83**	**155**	**178**	**126**	
Context Number	**90**	**84**	**156**	**179**	**127**	
Feature Type	**Post hole**	**Post hole**	**Pit**	**Post hole**	**Pit**	
LATIN BINOMAL						**COMMON NAME**
Corylus avellana shell fragments			2	3	1	Hazel nut shell fragments
Polygonum spp.				1		Knotgrasses
POACEAE	1	1	39	13	1	Grass
Avena spp. awns			8			Oats awns
Hordeum spp.					1	Barley
Indeterminate Cereal			3			Indeterminate Cereal
Indeterminate Cereal chaff fragments				2		Indeterminate Cereal chaff fragments
Unidentified			2	1		Unidentified

Sample Number	**22**	**23**	**24**	**25**	**27**	
Feature Number	**131**	**202**	**204**	**187**	**211**	
Context Number	**132**	**203**	**205**	**188**	**212**	
Feature Type	**Pit**	**Gully**	**Curvilinear**	**Gully**	**Gully**	
LATIN BINOMAL						**COMMON NAME**
Corylus avellana shell fragments	4	2			2	Hazel nut shell fragments
Rumex L. spp.			3		1	Dock
BRASSICACEAE			1			Cabbage family
CYPERACEAE			1			Sedge family
POACEAE	12		12	1	3	Grass
Indeterminate Cereal	4		9	2	3	Indeterminate Cereal
Unidentified	1					Unidentified

Sample Number	**28**	**29**	**30**	**31**	**32**	
Feature Number	**215**	**217**	**219**	**222**	**172**	
Context Number	**216**	**218**	**221**	**223**	**173**	
Feature Type	**Stone hearth**	**Gully / Pit**	**Pit**	**Post hole**	**Pit**	
LATIN BINOMAL						**COMMON NAME**
Corylus avellana shell fragments	108	12	1		4	Hazel nut shell fragments
Polygonum spp.		2				Knotgrasses
BRASSICACEAE		1				Cabbage family
CYPERACEAE		1				Sedge family
POACEAE	9	3	1	4	9	Grass
Indeterminate Cereal	4	12	4	5	11	Indeterminate Cereal
Indeterminate Cereal chaff fragments		1				Indeterminate Cereal chaff fragments

Sample Number	**33**	**34**	**35**	**40**	**41**	
Feature Number	**226**	**141**	**149**	**263**	**124**	
Context Number	**227**	**142**	**150**	**264**	**125**	
Feature Type	**Post hole**	**Pit**	**Pit**	**Pit**	**Pit**	
LATIN BINOMAL						**COMMON NAME**
Corylus avellana shell fragments	3	1	8	1	9	Hazel nut shell fragments
Chenepodium / *Atriplex* spp.			6		1	Goosefoot / Orache
Polygonum spp.	1		50+			Knotgrasses
Rumex L. spp.			5	2		Dock
BRASSICACEAE			1			Cabbage family
Galium aparine			4			Cleaver
POACEAE	13	35	300+	2	4	Grass
cf. *Avena* spp.			200+			Probable Oat
Avena spp. awns			200+			Oats awns
Indeterminate Cereal	5	7	100+	6	20	Indeterminate Cereal
Indeterminate Cereal detached embryo			1			Indeterminate Cereal detached embryo

Unidentified Cereal rachis segment fgts.			23			Unidentified Cereal rachis segment fgts.
Unidentified Cereal rachis internodes			3			Unidentified Cereal rachis internodes
Unidentified			50+	7	8	Unidentified

Table 2: **Charcoal -** *Complete list of taxa recovered from excavations at land at Cefn Graianog Quarry (G1598)*
Taxonomy and Nomenclature follow Schweingruber (1978).

Sample Number		**1**	**2**	**3**	**4**	**5**	**6**	**8**	**9**
Feature Number		**21**	**19**	**66**		**102**	**105**	**118**	**120**
Context Number		**23**	**18**	**67**	**98**	**103**	**107**	**119**	**122**
Feature Type		**Pit**	**Pit**	**Gully**	**Spread : In-situ burning**	**Pit**	**Pit**	**Post hole**	**Pit**
No. fgts.		**4000+**	**36,000+**	**5000+**	**400+**	**7000+**	**5000+**	**1500+**	**3000+**
Max. size (mm)		**34**	**47**	**25**	**17**	**16**	**17**	**14**	**20**
Latin	**Vernacular**								
Corylus avellana	Hazel			53	21		89	82	
Salix / *Populus*	Willow / Poplar				9				
Quercus	Oak	100	100	47	16	100	11	8	100
Indeterminate	Indeterminate				44			10	

Sample Number		**10**	**11**	**12**	**13**	**15**	**16**	**17**	**18**
Feature Number		**79**	**77**	**28**	**89**	**83**	**75**	**155**	**178**
Context Number		**80**	**78**	**93**	**90**	**84**	**76**	**156**	**179**
Feature Type		**Post hole**	**Post hole**	**Gully**	**Post hole**	**Post hole**	**Pit**	**Pit**	**Post hole**
No. fgts.		**50+**	**100+**	**50+**	**100+**	**150+**	**300+**	**500+**	**300+**
Max. size (mm)		**10**	**23**	**11**	**13**	**9**	**15**	**18**	**17**
Latin	**Vernacular**								
Corylus avellana	Hazel		16		19	30		35	23
Salix / *Populus*	Willow / Poplar	3			5		85	56	61
Quercus	Oak	28	67	20	54	49	15		16
Indeterminate	Indeterminate	19	10	30	22	21		9	

Sample Number		**19**	**22**	**23**	**24**	**25**	**26**	**27**	**28**
Feature Number		**126**	**131**	**202**	**204**	**187**	**206**	**211**	**215**
Context Number		**127**	**132**	**203**	**205**	**188**	**207**	**212**	**216**
Feature Type		**Pit**	**Pit**	**Gully**	**Curvilinear**	**Gully**	**Gully**	**Gully**	**Stone hearth**
No. fgts.		**200+**	**300+**	**250+**	**600+**	**400+**	**250+**	**2500+**	**300+**
Max. size (mm)		**10**	**14**	**13**	**15**	**16**	**14**	**17**	**13**
Latin	**Vernacular**								
Corylus avellana	Hazel				33	58	51	82	19
Salix / *Populus*	Willow / Poplar	45	53	37		16	29	15	33
Quercus	Oak	29	47	48	65	26		3	5
Indeterminate	Indeterminate	26		15	2		20		43

Sample Number		**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**
Feature Number		**217**	**219**	**222**	**172**	**226**	**141**	**149**	**229**
Context Number		**218**	**221**	**223**	**173**	**227**	**142**	**150**	**230**
Feature Type		**Gully / Pit**	**Pit**	**Post hole**	**Pit**	**Post hole**	**Pit**	**Pit**	**Pit**
Phase									
No. fgts.		**4000+**	**7000+**	**2500+**	**600+**	**150+**	**300+**	**500+**	**100+**
Max. size (mm)		**21**	**17**	**16**	**13**	**14**	**13**	**16**	**11**
Latin	**Vernacular**								
Corylus avellana	Hazel	37	10	55	4	17	30	100	
Salix / *Populus*	Willow / Poplar	63	44		61		38		17
Quercus	Oak		37	36	28	40	24		
Indeterminate	Indeterminate		9	9	7	43	8		83

Sample Number		**37**	**38**	**39**	**40**	**41**	**42**
Feature Number		**238**	**247**		**263**	**124**	**240**
Context Number		**239**	**248**	**260**	**264**	**125**	**241**
Feature Type		**Pit**	**Pit**	**Spread**	**Pit**	**Pit**	**Pit**
No. fgts.		**4000+**	**300+**	**300+**	**250+**	**500+**	**2000+**
Max. size (mm)		**14**	**13**	**15**	**14**	**17**	**15**
Latin	**Vernacular**						
Corylus avellana	Hazel	20	25	3	19	39	9
Salix / *Populus*	Willow / Poplar	16	30	39	48		38
Fraxinus excelsior	Ash	41	33				
Quercus	Oak	23				61	53
Indeterminate	Indeterminate		12	58	33		

Table 3: **List of Environmental Samples**

Sample Number	Feature Number	Context Number	Feature Type
1	21	23	Pit
2	17	18	Pit
3	66	67	Gully
4		98	Spread
5	102	103	Pit
6	105	107	Pit
8	118	119	Post hole
9	120	122	Pit
10	79	80	Post hole
11	77	78	Post hole
12	28	93	Gully
13	89	90	Post hole
14	91	92	Post hole
15	83	84	Post hole
16	75	76	Pit
17	155	156	Pit
18	178	179	Post hole
19	126	127	Pit
20	72	73	Pit
21	68	69	Pit
22	131	132	Pit
23	202	203	Gully
24	204	205	Curvilinear
25	187	188	Gully
26	206	207	Gully
27	211	212	Gully
28	215	216	Stone Hearth
29	217	218	Gully / Pit
30	219	221	Pit
31	222	223	Post hole / Pit
32	172	173	Pit
33	226	227	Post hole
34	141	142	Pit
35	149	150	Pit
36	229	230	Pit
37	238	239	Pit
38	247	248	Pit
39		260	Spread
40	263	264	Pit
41	124	125	Pit
42	240	241	Pit

APPENDIX IV: STONE ASSESSMENT REPORT

G1598 CEFN GRAIANOG

STONE OBJECTS by George Smith

(069) - Natural glacial cobble.

FLINT

Subsoil/Natural feature - Flint, light grey with slight yellow iron staining. Secondary blade. Probably punch-struck. No platform. Thin off-white cortex indicates it was produced from a locally sourced glacial flint pebble. No visible signs of use although with one convex sharp edge. Probably Later Mesolithic or Early Neolithic. 36mm x 14mm x 6mm

(080) – Flint, light grey with slight yellow iron staining. Secondary flake butt fragment. ?soft hammer struck. Undateable. 10mm x 11mm x 4mm

(084) – Flint falke fragment or chip, under 10mm max. Light grey. Too small to be sure it is man-made rather than accidental. Undateable.

(173) – Flint, light grey with slight yellow iron staining. Irregular flake fragment, probably slightly burnt. Undateable. 15mm x 9mm x 5mm

APPENDIX V: ARCHAEOMETALLURGICAL ASSESSMENT REPORT

GeoArch

Report 2015/19

Assessment of archaeometallurgical residues from Cefn Graianog, G1598 (2014)

Revised Version; replaces Report 2015/12

Dr Tim Young

5th October 2015

Assessment of archaeometallurgical residues from Cefn Graianog, G1598 (2014)

(revised version)

Dr T.P. Young

Abstract

This was a small assemblage (23.3kg of residues, from 36 distinct contexts) mainly from three distinct complexes of features, together with lesser quantities of residues from several isolated features. Only seven contexts yielded more than 1kg of residues.

The dominant macro-residues were varieties of flow slags from bloomery iron smelting. Although much of this material was in the form of individual prills and slag droplets, the collection included some flows where the prills were aggregated into elongate composite flows, morphologically resembling tapped slag. A few examples of these flows showed a degree of reddening, supporting the possibility of the flows having been tapped from the furnace. A further additional flow showed deformation, with half of the width of the flow inverted onto the other – suggesting manipulation of the semi-solidified flow. The material closely resembles that recovered during the 2012/13 seasons, subsequently dated to a period within the 7th – 9th centuries AD.

Some fragments of macro-residue were almost certainly from smithing and the sieved residues showed significant quantities of hammerscale (both flake and spheroidal) within many of the contexts (17 out of 36 contexts).

Several contexts (17 in total) contained particles of bog iron ore, with three contexts containing significant quantities (one containing almost 2kg).

In addition to a few isolated contexts, the residues occur in four separate complexes of features, potentially buildings, with the material from the 2013 indicating a fifth such focus. Of the four describe here, the western Complex 1 produced approximately 3.6kg of residues, with moderately abundant hammerscale in some contexts, the central Complex 2 yielded 12.5kg of residues, with three contexts yielding good assemblages of smelting slags and most productive contexts producing evidence for both smelting and smithing and the eastern Complex 3 produced evidence for smelting alone, including a large collection of bog iron ore. Complex 4 produced only very limited metallurgical evidence. The precise nature of the potential metallurgical features within each complex requires further investigation.

The presence of tapslag-like residues in Complexes 1 and 2 as well as a folded slag flow in the more Complex 1, suggests (but does not prove conclusively) that these areas may have been associated with the use a slag-tapping technology (potentially younger than the non-tapping). The eastern complex yielded no such materials and might therefore (but again not certainly) have been using a non-tapping technology, as appeared to be the case with the material from 2013.

The location of the site on a gravel ridge above a low-lying boggy area, suggests that it may have formed a location for the smelting of locally-derived ores.

Further analytical investigation of the assemblage is strongly recommended.

Contents

Methods

All materials were examined visually with a low-powered binocular microscope where required. As an evaluation, the materials were not subjected to any high-magnification optical inspection, not to any form of instrumental analysis. The identifications of materials in this report are therefore necessarily limited and must be regarded as provisional.

This report replaces Young (2015c) which describe only a subset of the material; this report addresses the entire collection.

The examined materials are listed in Table 1.

This project was commissioned by Dave McNicol, of the Gwynedd Archaeological Trust.

Results

Description of residues

The submitted materials amounted to an overall total of approximately 26kg. The macroscopic material collection totalled approximately 20.8kg, of which 3.9kg was fine debris and dust, 2.4kg was iron ore and 280g of concretions. Of the 14.2kg of archaeometallurgical residues, 9.5kg comprised flow slags, 3.6kg were indeterminate iron slags, with the remainder including various other classes. Most of the sampled contexts also had samples of sieved and magnetically-separated microresidues. The summary catalogue of the material is presented in Table 1.

Bloomery iron smelting residues

Most of the collection comprised flow slags. Of these, 8.7kg were grey-coloured flow slags. Some of these were elongate and fragile, but most of the pieces were either from conventional flows or were from masses of coalesced flows, commonly superficially resembling tapped slag. The coalesced specimens were themselves typically rather elongate and narrow. There were no pieces of substantial accumulations. These materials did not show any reddening of their surfaces. One fragment (from context (173)) showed half of a coalesced flow mass folded and inverted on top of the other half, indicating deformation when semi-molten. Most of the individual flow lobes and tubes within the flow slag were small, mostly less than 15mm diameter and the majority of only half that value, but some contexts contained a significant proportion of much broader, inflated lobes, probably indicating continued slag supply with little lateral flow.

A further 830g of flow slag accumulations showed a slightly reddened, maroon, surface, suggesting surficial oxidation of the slag when hot – such as may occur when slag is tapped from the furnace.

Probably related to the flow slags are a small quantity of fragments of narrow slag rods and runners (total 290g).

Most of the flow slags showed bases dimpled through contact with fuel, although some were entirely rough-surfaced, suggestive of flow through the basal ashy sediment. Some of the otherwise smooth-surfaced flows showed slight wrinkling of the upper surface from contraction or deflation, and some showed an unusual minutely dimpled texture cause by a very high vesicularity just below the top of the flow lobes.

Smithing slags

There were no complete, certain examples of smithing hearth cakes (SHCs), but several fragments that may derive from SHCs were recovered. None was a certain example.

There were also two fragments from the burr region of slag cakes (the burr is the zone where the hot zone impinges on the wall, just below the blowhole, resulting in erosion by melting of the wall into a smoothly arcuate embayment with a highly indurated surface). Burrs may develop in both smelting furnaces and smithing hearths; the present examples are small (resembling those formed in smithing hearths) but are thin (a feature sometimes more commonly found in smelting furnace slags).

Indeterminate residues

There was a variety of dense slags totalling 3.6kg with a charcoal-rich or more massive fabric, or fragmented to a degree to which they no longer exhibited diagnostic features that might allow them to be assigned to either smithing or smelting.

In addition, there was a total of 283g of vitrified hearth or furnace ceramic and 112g of slag derived mainly from the melting of the wall, with little input of iron.

Neither group could be attributed to a process with any certainty and most of this material occurred in very small fragments.

Iron ore
Small particles of iron ore occurred widely in the sieved samples, both as raw and haematised (roasted) pieces, typically with a particle size of less than 2mm. The macroscopic collections also included ore material, with contexts (67), (227) and (230) yielding collections of 178g, 213g and 1982g respectively.

Most of the ore is a bog iron ore with thin veinlets and mottles of a pinkish-brown hydrated iron oxide. A lesser proportion of the material appears to be very manganese-rich, with small fragments of soft wad-like concretions, together with tubular concretions in a similar material (context (230).

Other
The macroscopic collections included, in addition to the material described above, rare fragments of fired clay that were not demonstrable hearth/furnace lining, occasional fragments of vitrified or glazed pebbles, and concretions formed around iron or slag (sometimes containing charcoal and hammerscale).

The microscopic residues were rich in clasts of stone (some magnetic, especially where heated), occasional burnt bone fragments and finely granular magnetic material (some of which may be ore, but some perhaps secondary minerals derived from alteration of slag or iron).

The assemblage also included three examples of thin slag films with a right angled re-entrant. Such slag films are usually caused by slag adhering to the tip of the smith's poker or tongs. Although typically an indicator of smithing, such artefacts might also be formed during smelting.

Distribution of residues
The distribution of the residues is illustrated in Table 2 and in Figure 1. This table divides the productive contexts by geographical area and indicates the total weight of various macroscopic residue classes and a general indication of the abundance of microresidues.

The residues occurred, mostly in very small quantities, in a variety of isolated contexts in the north and west of the 2014 area (contexts (69), (73), (99) and (122)). The very low concentrations suggest that these may not have bene metallurgical features, although the hammerscale and slag associated with the in-situ burning in context (122) (a fill of pit [120]) hints at the possibility of use of this pit as a smithing hearth.

The majority of the residues were contained within the fills and spreads of four complexes of cut features (Complexes 1-4 of Table 2 and Figure 1; the complexes are employed here simply as a means of differentiating the various productive feature clusters). A similar cluster of features from the 2013 season is identified as Cluster 5. Although the complexes differ in detail, they typically include both spreads (probably the remains of working floors) and distinct cut features, typically beneath the spreads.

Complex 1 comprised fills from eight adjacent cut features ([131], [141], [149], [155], [159], 172] and [178]) together with spread (133). A series of sparse assemblages from cut features immediately to the south ([187], [199}, [202] and [204]) are also included here, although it is possible they are associated with a separate structure. Four of the adjacent features contain rich assemblages of hammerscale, suggesting smithing had taken place within the immediate area. Smelting slags were also present, including examples of possible tapped slag (in pit [172]). The amounts of flow slags were however fairly low, with pit [124] containing the greatest, but with a total of just 726g of residues. The gullies to the south of Complex 1 may form a separate complex; they yielded only small quantities of slag and hammerscale, and so were probably distant from the actual metalworking.

Complex 2 yielded a larger quantity of residues (12.5kg of submitted material over half of the total). The residues included both smithing and smelting residues. The greatest quantities of smelting residues were from gully [211] (3855g), gully or pit [217] (5607g) and pit [240] (1601g). Gullies [211] and [217], together with pit [126] yielded rich assemblages of hammerscale, and five other contexts also yielded scale. Sub-circular cut [124] yielded not only scale, but also the only large fragment of a SHC from the site. The productive cut features included two equant pits (cuts [124] and [222]), several slightly elongate pits (cuts [126], [215], [217], [240] and [244]), and two similarly-sized elongate cuts (cuts [206] and [211]). Complex 2 contained a symmetrically-located stone hearth, but this contained only a concretion on a small iron artefact and no archaeometallurgical residues.

Complex 3 included a spread rich in smelting debris (total 3.4kg), together with a small pit [229] (0.45 x 0.28 x 0.2m) that contained approximately 2kg of bog iron ore and a shallow slightly elongate pit ([263]; of similar dimensions to the main group of pits in Complex 2).

Interpretation

The amount of archaeometallurgical waste recovered from the site is relatively low. This may reflect the deposition of the waste into slag mounds or other areas of deposition not preserved into the archaeological record. There are no large, deep features close to the likely foci of activity to have accumulated waste. Much of what is preserved is either in shallow features or in spreads that are probably the working floors.

A close parallel for the style of feature (and complex) found on this site is to be found in the site at South Hook, Pembrokeshire (Crane & Murphy 2010), a site with metallurgical activity of the 9th-10th centuries AD. South Hook provided excellent structural evidence for two early slag tapping bloomery furnaces, but only 53kg of residues.

The majority of the residues at Cefn Graianog are indicative of bloomery iron-smelting. The details of the technology are unclear: although the majority of material suggests an origin in a non-slag tapping furnace. Such furnaces may have had a simple basal pit or chamber, into which the slag descended during the smelt, or they may have had a lower section of the shaft with a frontal arch (to permit clearance of the slag and probably the bloom) which functioned in the same manner. Some of the material, however, showed evidence for slag tapping (the common occurrence of elongate composite flow slag pieces, reddening of the slag surface and presence of deformed flow slags).

The residues and the contexts yielding them from the 2014 season, are very similar to those recovered in the 2013 campaign (Young 2015b; here referred to as Complex 5).

Identification of the individual cut features within the complexes is not straightforward. The nature of the associated working floors (archaeological spreads) means that deposits of mixed origin fill many of the features, thus internal fills may not necessarily be indicative of the use of the features.

The nature of the cuts requires further investigation (through further interrogation of the excavation records), but some possibilities may be investigated through consideration of the dimensions of the features.

The basal pits of early medieval non-slag tapping slagpit furnaces in southern Britain are typically in the range of 400mm to 1000mm diameter (e.g. Haslam 1980; Rainbird & Young in press; Reed *et al.* 2006; Young 2014, 2015a). Such pits might be one interpretation of the small equant pits ([229], [159], [222], [255]).

Simple floor-level smithing hearths are more variable in form, varying from circular to slightly elongate (ratio of long to short axes 1:1 to 1.6:1). Their long and short axes in plan are plotted in Figure 2 as pen squares. Examples from the early medieval of Ireland are shown as open squares in Figure 2 (sites at Killeany, Coolamurry, Garryleagh, Cornamucklagh and Aghavea; Young 2008b, 2008a, 2009, 2014a, 2014c). Examples of early medieval smithing hearths from South Wales are entirely different, with a dumbbell shape (one end the true hearth, the other a probable anvil setting; Young); their overall dimensions appear on Figure 2 by purple *). The hearth end of the S Welsh structures (1.25x1.1m at Pontardulais and 0.66x0.62m at Gelligaer) is also rather equant (ratio of long to short axes approximately 1.1). The Irish hearths have similar dimensions to the larger equant pits (pits [124], [172] and [141], as well as some of the elongate pits (e.g. pits [075] and [215]). Of these pits, it should be noted that pit [124] contained an SHC fragment and [172] tool casts and abundant microresidues.

There are few examples of early medieval slag-tapping furnaces known; these are illustrated by orange dots in Figure 2. They have ratios of long to short axes 2:1 to 3.75:1. These include examples from Ramsbury (Haslam 1980), Tisbury (author's unpublished data) and South Hook (Crane & Murphy 2010). This, admittedly small, dataset shows a degree of coincidence with the group of elongate pits (pits [075], [126], [149], [217], [219], [240], [244] and [263]).

Thus the pit morphology suggests various possible contenders for identification as slagpit furnaces, slag tapping furnaces and smithing hearths. Further work is required to clarify the identification of the archaeological features.

The interpretation of the smithing activity is hampered by the paucity of evidence. There are very few pieces of slag interpretable as the macroscopic residues of smithing. Hammerscale is, in contrast, locally abundant and generally widespread. The dominance of flake hammerscale would suggest the working of at last partly-consolidated iron (Young 2011) rather than the welding of blooms. This may suggest that the raw blooms produced by smelting were being smithed down to bar (or at least billet) on the site.

Discussion

The material from the 2014 season is broadly similar to that found on the site previously. The evidence for the smelting technology is slightly ambiguous: it may represent a mixture of slag tapping and non-tapping technologies, or perhaps an early form of slag tapping with a rather low volume of tapped slag. Several of the Cefn Graianog pits are of similar size to known early slag tapping furnaces and are worthy of further investigation.

The evidence for the nature of the smithing being undertaken is largely from the microresidues, which suggest that working down to bar (or even perhaps to artefacts) was being undertaken on site. This is similar to the situation at South Hook (Crane & Murphy 2010), but differs from that commonly encountered in England where most smithing may have been undertaken at estate/manorial centres, rather than at the site of smelting. It is possible that an abundance of ore in the adjacent wetlands allowed the Cefn Graianog smelting settlement to be rather more permanent than typical.

Dating evidence from the 2013 season includes radiocarbon dates from Complex 5 suggest a date within the period of late 7th century to late 9th century AD. Sites in southern England and South Wales have been interpreted (e.g. Young 2010; 2015) as suggesting the replacement of slag pit furnaces by slag tapping in the late 9th to early 10th centuries.

The situation in North Wales is even more poorly evidenced than further south. The non-tapping furnaces of the later Iron Age have been well documented by Crew (Crew 1987, 1989, 1991, 1998, 2009), and similar furnaces appear to have been employed locally during the Roman period. These furnaces had an arch to facilitate hearth clearance/repair (and possibly bloom removal). The furnaces are not recorded as possessing external working hollows (unlike other similar contemporary furnaces (e.g. Derrrinsallagh, Co. Laois, Ireland; Young 2008c; Knockbrack, Co. Kerry, Ireland, Hull & Taylor 2006). Thus it is possible that North Wales maintained a native tradition of non-tapping furnaces through the Roman period, in contrast to areas further south and east in which the Iron Age style of furnace may have been entirely replaced by slag-tapping variants in the Roman period. The only early medieval smelting site described in any detail to date, is that at Borras Quarry (work ongoing), which has yielded slags suggestive of probable non-tapping furnaces.

The occurrence of flow slags with both dull and shiny surfaces, slag spheroids, charcoal-rich ferruginous sediments, fine lining debris and spiky 'sinter' (probably of fine slag and ore particles) can be most closely paralleled with finds inside abandoned furnaces on some Irish sites (e.g. Celbridge, Young 2003a; Morrett Site 'D', Young 2005b), but somewhat similar fines assemblages have been found on some British Iron Age sites (e.g. the northern furnaces at Twinyeo, Devon, Young 2013). The significance of the fine scale residues from the basal pits at these sites may be that smelting at these sites produced modest volumes of slag compared with the pit volume, and that the pit was sufficiently deep that its base lay well below the bloom and immediately associated slag.

At many sites, the non-tapped flow slag preserves moulds of the original pit/chamber packing. Such a packing is usually of split wood (e.g. Carlin 2008; Rainbird & Young in press; Young 2003b, 2014) but is occasionally of cereal straws or grass (e.g. Mikkelsen

1997; Young 2015a). The Cefn Graianog assemblage contains no material for which a pit-packing was identifiable. This may reflect the tendency of the assemblage to include only smaller slag particles, but might also be circumstantial evidence for the use of slag-tapping process.

The characteristics of the site, with evidence for multiple workshops mostly undertaking both iron smelting and smithing, suggest a settlement that is arguably in the tradition of the earlier iron-making settlements of Crawcwellt West (Crew 1989, 1998, 2009) and Bryn-y-castell (Crew 1987, 2009). Dating the ironworking activity of the various complexes (presumably structures) will be important in determining their degree of contemporaneity.

Further work

The development of working floors in the complexes (both complexes 1-4 describe here and Complex 5, for which the residues were described in young 2014) has obscured the nature of the associated cut features; further work (through the interrogation of the field records) is required to increase understanding of the features.

The nature of the macroscopic residues as potential very early (for the early medieval) tapped slags gives their investigation a more than local significance. Indeed this stage of the development of the iron smelting process is under intense investigation elsewhere (e.g. Hemyock, Churchills Farm). The presence of collections of bog iron ore also give the assemblage significance, for the smelting residues should be able to be linked to the raw material.

The value of the collection is further raised by the presence of limited macro- and abundant micro-residues from smithing.

The artefactual material from the site should be checked to see if it includes any metallic iron produced at the site.

With all these components to the residue assemblage and important style of working, it is recommended that a programme of further laboratory analysis is conducted to characterise the process and to permit modelling of the efficiency and yield of the smelting process (details of the proposed methodology to be submitted separately).

Whether or not further detailed investigation is commissioned, the assemblage is one of regional and potentially national significance. It should there be deposited in its entirety with the site archive in an appropriate institution.

Figure Captions

Figure 1. Plan of features yielding archaeometallurgical residues (shown on red), based on provisional versions of the 203 and 2014 PX reports, showing the ‘complexes’ as employed in this report.

Figure 2. Plot of width against length for cut features yielding archaeometallurgical residues in Complex 1 (red), Complex 2 (blue), Complex 3 (green) and Complex 4 (grey). Comparative data are provided for smithing hearths from Ireland (open squares) and South Wales (*), as well as early medieval slag tapping smelting furnaces (orange). For sources of the comparative, data see text.

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Table 1: summary catalogue. Assm = assemblage, FHS = flake hammerscale, SHS = spheroidal hammerscale

C	S	other	Swt	wt	no	notes
67	3	slag	94	94	1	complex mass of flow slag; top distinctly maroon- so very likely to be tapslag
67	3	iron rich concretions (coarse)	178	178	21	fragments of coarse sand in silt with veins of iron oxide; a low grade ore
67	3	magnetic material	<1	<1	assm	mainly stone, trace of FHS
67	3	iron rich concretions?	4	4	assm	small concretionary fragments, including veined bog ore
67	3	possible metalworking debris	<1	<1	assm	mainly concretion, but some roast(?) ore and one piece FHS
69	21	metalworking debris coarse	40	40	asm	four pieces of flow slag and 1 small probable ore piece
69	21	magnetic material	<1	<1	assm	stone, granules, slag fragments
69	21	metalworking debris	4	4	assm	flow slag, lining slag, vitrified stone
69	21	ceramic	2	2	assm	probably fired clay, buff, with coarse sand
69	21	coal/cinder	<1	<1	2	1 piece coal?, 1 piece burnt residue, possibly burnt bone
69				21	1	flow-lobed slag fragment, with fuel-dimpled base
				16	1	slag lump with dimpled base.
73	20	metalworking debris	2	2	assm	10 fragments of flow slag, 3 stones
73	20	magnetic material	<2	<2	assm	stone, roast ore
76	16	possible metalworking debris	6	6	7	ore

C	S	other	Swt	wt	no	notes
99				100	3	highly Mn-encrusted fragments of massive and/or charcoal-bearing slag, details obscured
				38	1	dense flow slag fragment, one side dimpled, the other sandy attachment
122	9	metalworking debris	<1			
				<1	1	single coffee bean spheroid
122	9	metalworking debris	68	68	2	large fragment dense rusty slag resting on indurated grey ceramic, also tiny fragment of rusty indeterminate slag
122	9	magnetic material	2	2	assm	mainly stone ,some fine slag debris and some FHS
125	41	metalworking debris	358			
				224	1	possible fragment of SHC, maximum of 50%, micro-dimpled, body of slag porous with rounded void and some charcoal impressions
				50	6	fragments of dark shiny flow slag
				4	2	small blebs with explosion from corroding iron
				80	20	indeterminate slag fragments
125	41	md magnet	6	6	assm	mainly stone and slag debris, some FHS and rare SHS
125	41	metalworking debris	28			
				28	assm	flow slag fragments, lining slag fragments, concretions, roasted ore, slag spheroids
125				14	1	flow slag fragment
				10	1	heavily accreted and altered slag fragment
				10	1	burr-like fragment of dense slag with quartz grains and rough attachment surface
127	19	metalworking debris coarse	326			
				94	18	small fragments of grey flow slag
				80	1	large very dense inflated single flow lobe

C	S	other	Swt	wt	no	notes
				12	1	dull flow slag in irregular lobes
				56	2	base of dense slag- unclear if very large flow slag lobes or crust-like cake
				72	38	small fragments of indeterminate slag
127	19	metalworking debris	90			
				90	assm	slag debris, mostly flow type slags, some haematised, some look very abraded
127	19	metalworking debris magnetic	4			
				4	assm	slag, ore, moderate FHS
127				74	1	tap slag like block, but no reddening. Dense flow lobes rest on highly vesicular basal fracture
				30	1	fragments of tap-slag like material
				11	1	rounded slag fragment
132	22	magnetic material	<1	<1	assm	ferruginous granules, FHS, single slag fragment
132	22	metalworking debris coarse & fine	36	36	assm	variety of slag types, some stone and a concretion
133				36	2	flow slag fragments
142	34	metalworking debris magnetic	<2	<2	assm	mainly stone , some ore (some roast), some slag debris, some FHS and rare SHS
142	34	metalworking debris coarse	132			
				30	3	low density lining slag in flow slag prilly flows
				6	3	small dense slag fragments
				22	1	very rusty low-density flow slag flow (probably) but sheet-like form does not exclude other possibilities
				76	14	dense flow slag fragments
142	34	metalworking debris	16	16	assm	ore, concretion, lining, slag, flow slag, slag spheroid

C	S	other	Swt	wt	no	notes
148				86	1	fragment of composite flow slag flow, rather like tapslag, but no reddening, fuel impressions on base, smooth grey, plastic lustre
150	35	metalworking debris coarse	310			
				78	9	pale grey flow slag, mostly in fairly small pieces
				22	1	dull flow slag in somewhat conical form
				4	1	vitrified lining
				122	1	strange rounded charcoal-bearing slag nub with some lining-influenced material. Dense and showing some signs of exploding suggesting it contains iron. Is this evidence of 'raking'?
				76	30	small fragments of indeterminate iron slag
150	35	metalworking debris	22			
				22	assm	flow slags, lining, other slag fragments, concretions
150	35	metalworking debris magnetic	10	10	assm	mostly slag and ore, moderate level of FHS, some stone
150				70	1	fragment of charcoal-rich slag with small-scale prilly base
155				16	1	anastomosing prills of flow slag, wrinkled, with dimpled base
				9	1	vesicular slag adhering to fired clay
				3	1	vesicular slag fragment
156	17	metalworking debris coarse	220			
				32	10	flow slag fragments
				52	6	other dense slag fragments
				6	4	vitrified lining fragments
				6	3	concretions
				2	1	very thin slag sheet - possible slag flat but probably simply a non-wetted surface
				128	assm	indeterminate fragments, debris and dust

C	S	other	Swt	wt	no	notes
156	17	possible furnace lining	200			
				200	3	sandy/gravelly concretions with charcoal, slag fragments and abundant FHS
156	17	metalworking debris	92			
				92	assm	slag fragments, concretions, lining, plenty of FHS, large spheroids
156	17	metalworking debris magnetic	4	4	assm	stone, granules, some slag, but rich in FHS, trace of SHS
160				15	1	flow slag prill
173	32	metalworking debris coarse	434			
				116	16	fragments of flow slags, some with maroon surface
				72	1	large flow slag fragment, folded in half, dimpled base and flow lobed top inverted on one side
				2	1	slag film with 90 degree re-entrant, probably flaked-off from tool
				36	2	large pale flow-lobed slags, like flow slags but very low density
				156	8	rough fragments of fine charcoal-bearing slag, some have rounded lining slag-like surfaces
				54	29	small indeterminate slag fragments
173	32	metalworking debris	80			
				80	assm	mainly rather irregular worn slag fragments, some flow slag and some large spheroids, rare ore fragments
173	32	metalworking debris magnetic	16	16	assm	mainly finely granular material, some clear stone, some probable slag fragments and moderate amount of FHS
173				151	4	smooth masses of flow slag prills,
				142	3	rough surfaced flow slags in broader flows
				97	6	fragments of prilly charcoal rich slags
179	18	metalworking debris	2	2	assm	slag, roast ore, FHS, lining

C	S	other	Swt	wt	no	notes
179	18	magnetic material	2	2	assm	slag, granules of ore, moderately abundant FHS
188	25	rock crystal chip	<1	<1	1	quartz fragment
188	25	magnetic material	1	1	assm	stone, granules, slag fragments, FHS
188	25	metalworking debris	2	2	assm	flow slag, rust, ore, vitrified lining,
199				70	6	slag prills, one rough, the others smooth. One of the smooth pieces is very pale and glassy
203	23	magnetic material	1	1	assm	stone, granules, sparse FHS
203	23	metalworking debris fine & coarse	10	10	assm	flow slags, lining slag, concretion
205	24	magnetic material	1	1	assm	stone, slag fragments, single SHS
205	24	iron rich concretions	2	2	assm	natural iron panning in sand/gravel
205	24	metalworking debris coarse	<1	<1	1	flow slag fragment with slightly maroon surface
207	26	metalworking debris	4	4	assm	mainly small pieces of flow slag, one concretion bearing FHS
207	26	metalworking debris coarse	44			
				8	1	charcoal-rich concretion
				22	2	fragments from large dense lobes
				14	4	dense slag pieces
207	26	metalworking debris magnetic	<2			
				<2	assm	stone, ore, lining, trace FHS

C	S	other	Swt	wt	no	notes
211	30	metalworking debris coarse	2780			
				1045	assm	indeterminate rusty (mainly) slag fragments debris and rust. At least some apparent FHS
				1010	166	flow slag, mainly in fragments of individual prills but a few tap slag-like blocks
				135	3	large lobes - inflated flow slag
				140	1	large block of piled lobes, probably from the margin of a furnace bottom cake. Low density
				50	4	dull flow slag
				275	6	irregular blocks of massive slag, rusty, one is a slice of an SHC-like mass
				30	4	vitrified lining
				10	2	soft earth dark brown concretions
				55	1	piece of thin burr, with flow slag intruding lining below burr proper; altered lining only has a thin skin of slag overlying it - so presumably a smelting burr
				5	1	small fragment of similar burr
211	30	metalworking debris (remainder bagged)	78			
				78	assm	mainly flow slag debris, rich in spheres, one large slag flat or tool coating, some glazed stones
211	30	magnetic material	22	22	assm	lining slags, abundant FHS and SHS, indeterminate granular material (corroded iron/slag/concretion?)
212	27	metalworking debris coarse	950			
				522	98	dense flow slags
				102	6	slag in dense sheet-like form, probably basal crusts, but at least two pieces could be SHC fragments
				20	2	lining slags
				6	1	stone
				300	assm	small indeterminate slag fragments and dust
212	27	furnace lining coarse	72	70	assm	
				48	8	vitrified furnace lining
				10	2	stone fragments

C	S	other	Swt	wt	no	notes
				6	1	flow slag fragment attached to ferruginous concretion
212	27	metalworking debris coarse	96			
				96	assm	small fragments of flow slags including many coffee-bean spheroids
212	27	metalworking debris/concretion?	32			
				32	assm	poor slag debris and (ashy?) concretions
212	27	magnetic material	16			
				16	assm	mainly rusty debris and a few slag fragments. Rare FHS and SHS
212				111	7	flow slag fragments, mostly with dimpled bases and one with cavernous top caused by upper vesicular layer
216	28	iron object coarse	4	4	1	flat iron concretion on uncertain oval slightly dished core
216	28	metalworking debris (remainder bagged)	2	2	assm	stone, flow slag fragments, burnt bone
216	28	magnetic material	<2	<2	assm	stone
218	29	1 of 3 coarse	1690			
				520	89	grey flow slag, mainly in small pieces but a few tap slag-like amalgamations
				282	1	large block of granular rusty slag, internal structure not visible
				172	4	irregular slag fragments of larger size than main debris collection
				168	1	sheet of internally-lobed material on non-wetted chilled base. Slag contains pre-existing droplets and stone clasts. Maybe slowly-accumulated hearth floor? Main part of slag is delicate coralline olivine
				550	assm	indeterminate slag fragments, debris and dust
218	29	2 of 3 coarse	2500			
				512	8	tap slag-like material with very broad (but few) bulbous flow lobes

C	S	other	Swt	wt	no	notes
				892	127	grey flow slag, mostly in small fragments
				40	10	vitrified lining material and lining slags
				54	8	stones
				38	1	blebby tongue-like lining slag mass
				172	2	incomplete sheets of amalgamated prills - could be from furnace floor/side or might be incipient SHCs
				40	2	thin sheet fragments with tubular vesicles
				730	assm	indeterminate fragments, debris and dust
				2	2	rust spalls
						plus several charcoal fragments
218	29	3 of 3	2255			
				996	128	small fragments of grey flow slag
				620	assm	indeterminate slag fragments, debris and dust
				26	1	45mm length of slag rod, c15mm diameter
				12	1	possible half section of rod
				64	5	FB-like material of small amalgamated blebs
				54	1	beard-like mass of spiky, blebby, slag attached to curved sheet, granular on other side; could be slag penetrating into ash floor perhaps. Perhaps peeled from floor or wall
				14	1	elongate fragment of similar sheet with spiky slag
				62	7	blebby/granular slags in small amalgamations - including one with possible cylindrical tool hole
				24	5	lining/fuel ash slag
				4	2	vitrified lining
				6	2	possible manganese oxide concretion
				52	1	ferruginous concretion
				104	3	dense slags with dimpled bases and large rounded voids
				38	6	fragments of thin slag sheets of uncertain origin
				14	3	slag blebs attached to stone chips
				50	1	irregular dimpled/blebby slag flow sheet
				20	1	coalesced rounded blebs forming thin sheet
				74	1	irregular mass of flowed slag of rather low density in elongate mass

C	S	other	Swt	wt	no	notes
				4	1	stone
218	29	possible furnace lining	112			
				106	21	fragments of deeply vitrified and slagged lining. Some clearly from near blowhole, no pieces with blowhole itself
218	29	metalworking debris (remainder bagged)	56			
				56	assm	slag debris, flow slags, spheres, flats, FAS etc plus some rust/concretion.
218	29	magnetic material	14	14	assm	stone, granules, some slag, plenty of FHS
218				52	1	charcoal rich slag attached to oxidised-fired wall - probable sub-blowhole attachment.
				37	4	flow slag fragments, one very long and delicate
220	39	possible furnace lining	14	14	1	thickly slagged oxidised furnace/hearth lining
221				64	1	prills - probably part of a small birds foot of divergent flows
				3	1	prill fragment
				93	1	irregular block of vesicular, possibly charcoal-bearing, slag; encrusted in secondary oxides.
223	21	metalworking debris fine & coarse	20	20	assm	most of weight is large lining slag lobed nub, smaller fragments include small flow slag, ore, stone, and concretion fragments on corroded iron with imprints of ?straw
223	31	magnetic material	2	2	assm	stone, granules, FHS, SHS
227	35	metalworking debris	210	210	assm	mainly fragmented bog ore with a few small slag fragments; many fragments slightly reddened
227	33	metalworking debris coarse	66			
				20	4	flow slags
				2	3	roasted ore

C	S	other	Swt	wt	no	notes
				1	2	ore
				28	1	rusty charcoal-bearing slag
				2	4	indeterminate slag fragments
230	36	metalworking debris coarse	2180			
				198	14	flow slag, dense
				1982	assm	bog ore, variable density
230	36	metalworking debris (remainder bagged)	30	30	assm	ore (including ?wad tubes) flow slag, unclear if ore/wad are detrital or authigenic
241	42	metalworking debris coarse	1540			
				994	94	well-formed flow slag in mainly narrow lobate horizontal flows
				76	5	dull-surfaced flow slag in very elongate conical lobes
				116	1	rather scrappy runner, 40mm wide base, dimpled base, shallow, passes towards mounded rusted slag at one end
				351	assm	lots of small indeterminate slag fragments
				1	1	thin possible slag cast from tool tip with rounded end
				2	1	small fragment of oxidised-fired vitrified lining
241	42	metalworking debris	122	122	assm	mainly flow slag assemblage, prills, blebs, lobes and other fragments; also some lining slag, lots of coffee beans
241	42	metalworking debris magnetic	16	16	assm	mainly FHS, some slag debris, rare SHS, some concretionary material
241				62	3	coalesced flow slag prills
246				117	1	anastomosed flow slag prills, individual prills only rather loosely bonded
				12	1	flow slag prill
248	38	magnetic material	<1	<1	assm	stone, FHS, rare SHS

C	S	other	Swt	wt	no	notes
248	38	metalworking debris	<1	<1	assm	1 ore, 1 roasted ore and 1 slag particle
260	39	md sample bagged	56	56	assm	mostly flow slag fragments, but also fragments of charcoal-bearing slag, concretion with spheroids
260	39	metalworking debris	3190			
				1615	162	pale to mid grey flow slag, mostly very tapslag like. One piece has sandy base to part as well as usual fuel contact base. Mostly elongate flows with few lobes
				746	21	variant of flow slag with little flow but ballooning lobes up to 50mm wide and 30mm deep. One runner-like piece is even larger and has flat base and raised top
				92	1	possibly large lobe as above, but might be broken margin from a plano-convex cake
				136	2	two flow slag pieces with elongate runner/rod like form, up to 30mm wide and deep
				102	3	rather featureless slag blocks showing signs of cracking fom iron explosion.
				42	2	iron slag with possible furnace floor/wall ceramic attached
				42	1	slag fragment from possible SHC, tubular vesicles at base. Porous above, may just been from one of the big flow types
				546	assm	fine slag debris, indeterminate slag fragments and dust
260	39	magnetic material	14	14	assm	slag debris with ore and concretions, but no hammerscale
260				61	5	elongate prill fragments, two largely clear of adhering materials and smooth, the other three rough.
264	40	metalworking debris	306	306	assm	small ore fragments, rusty debris, slag fragments, slag spheres, lining fragment
264	40	metalworking debris coarse	266			
				188	20	flow slags - mainly in long thin flows across floor
				1	1	probably vein-like mineralisation in coarse sandy sediment
				1	1	coarse sandy material with parallel bloating foliation; probably lining
				76	55	slag debris without clear surviving signs of flow

C	S	other	Swt	wt	no	notes
264		pot	8	8	2	fragments of vitrified reduced-fired lining

Table 2: summary of residues from Cefn Graianog 2014, by complex and context.

Area	C	cut	context description	debris etc	tap slag	flow slag	indet dense	rods & runner	burr	SHC	lining	fired clay	lining slag	Vitr. stone	ore	concr -etion	spheroid	tool cast	FHS	SHS	*total*
N	69	68	fill of pit [068]; sub-circular 2.1x1.4x0.82m			21	16					y	y	y							*37*
N	73	72	main fill of sub-rectangular pit [72], 2.1x1.4x0.42m			y									y						*0*
N	99	99	spread, 1.5x1.3x0.05m			38	100														*138*
W	122	120	in-situ burning within pit [120], 2.2x1.2x0.23m				68										y		y		*68*
Cpx 1	132	131	fill of [131], possible sub-rectangular pit, 1.5x1.35x0.11m																		*0*
Cpx 1	133	133	spread: brownish grey sandy silt deposit			36															*36*
Cpx 1	142	141	fill of [141], sub-rectangular pit, 1.2x1.1x0.32m			98	6						30		y		y				*134*
Cpx 1	148	149	fill of [149], sub-rectangular pit, 1.75x0.95x0.28m			86															*86*
Cpx 1	150	149	in-situ burning within pit [149], 1.75x0.95x0.28m			100	268				4				y	y			Y		*372*
Cpx 1	156	155	fill of [155], sub-rectangular pit, 0.6x0.45x0.14m	128		48	66				6					200	y		Y	tr	*448*
Cpx 1	160	159	fill of [159], possible sub-oval pit, 0.65x0.35x0.1m			15															*15*
Cpx 1	173	172	upper fill of [172], sub-square pit, 1.1x0.93x0.32m		224	193	307								y		y	2	Y		*726*
Cpx 1	179	178	fill of [178], circular posthole, 0.21x0.18x0.35m				y								y				Y		*0*
Cpx 1	188	187	fill of [187], small curvilinear gully, 5x1x0.34m			y	y				y				y				y		*0*
Cpx 1	199	199	spread: light-mid greyish brown clayey silt deposit			70															*70*
Cpx 1	203	202	fill of [202], linear gully, 4.6x0.55x0.16m			y							y			y			y		*0*
Cpx 1	205	204	fill of [204], Slightly curvilinear gully, 7.3x0.45x0.16m			1	y									y				tr	*1*
Cpx 2	125	124	fill of pit [124], Sub-circular pit, 0.9x0.85x0.32m			64	94		10	224			y		y	y	y		y	y	*392*
Cpx 2	127	126	fill of [126], sub-rectangular pit, 1.35x0.6x0.19m			290	139								y				Y		*429*
Cpx 2	207	206	fill of [206], linear gully, 3.4x0.55x0.16m			22	14				y				y	8			y		*44*
Cpx 2	212	211	fill of [211], linear gully, 3.5x0.5x0.2m	1345		1825	517		60		78		20			y	Y		y	y	*3855*
Cpx 2	216	215	in-situ burning within stone hearth [215], 1.15x0.7x0.2m			y										4					*4*
Cpx 2	218	217	fill of [217], curvilinear gully/ pit, 1.8x0.45x0.25m	1900	512	1629	1256	38			150		62		6	54	y		Y		*5607*
Cpx 2	220	219	upper fill of [219], Sub-oval pit, 1.75x1.1x0.2m								14										*14*
Cpx 2	221	219	main fill of [219], sub-oval pit, 1.75x1.1x0.2m			67	93														*160*
Cpx 2	223	222	fill of [222], Circular posthole/ pit, 0.55x0.47x0.55m								20								y	y	*20*
Cpx 2	227	226	fill of [226], circular posthole, 0.21m diameter, 0.3m deep			20	30								213						*263*
Cpx 2	241	240	fill of pit [240], 1.15x0.45x0.27m			1132	351	116			2						Y		Y	y	*1601*
Cpx 2	246	244	fill of pit [244], 1.5x0.35x0.5m			129															*129*
Cpx 2	248	247	fill of posthole [247], 0.25m diameter, 0.24m deep				y								y				y	tr	*0*
Cpx 3	230	229	fill of [229], sub-rectangular pit, 0.45x0.28x0.2m			198									1982						*2180*
Cpx 3	260	260	spread: black clayey silt deposit	546		2422	236	136		42					y	y					*3382*
Cpx 3	264	263	fill of [263], irregular pit, 1x0.5x0.05m			180	76				9				1		y				*266*
Cpx 4	67	66	fill of gully [066]		94										178				y		*272*
Cpx 4	76	75	fill of possible sub-circular pit [075], 1.36x0.87x0.38m												6						*6*
			total	3919	830	8684	3637	290	70	266	283		112		2386	276		2			

Figure 1

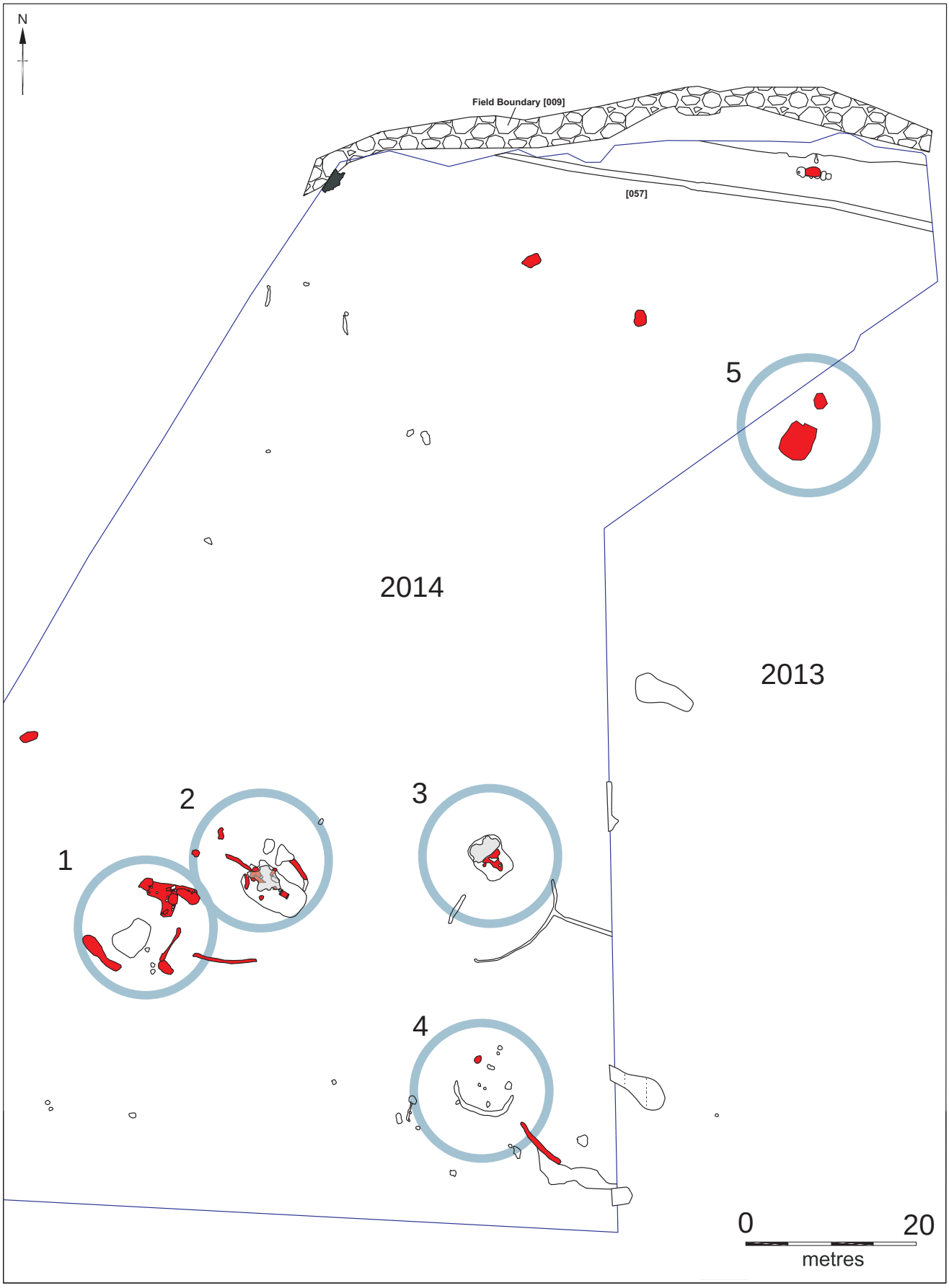
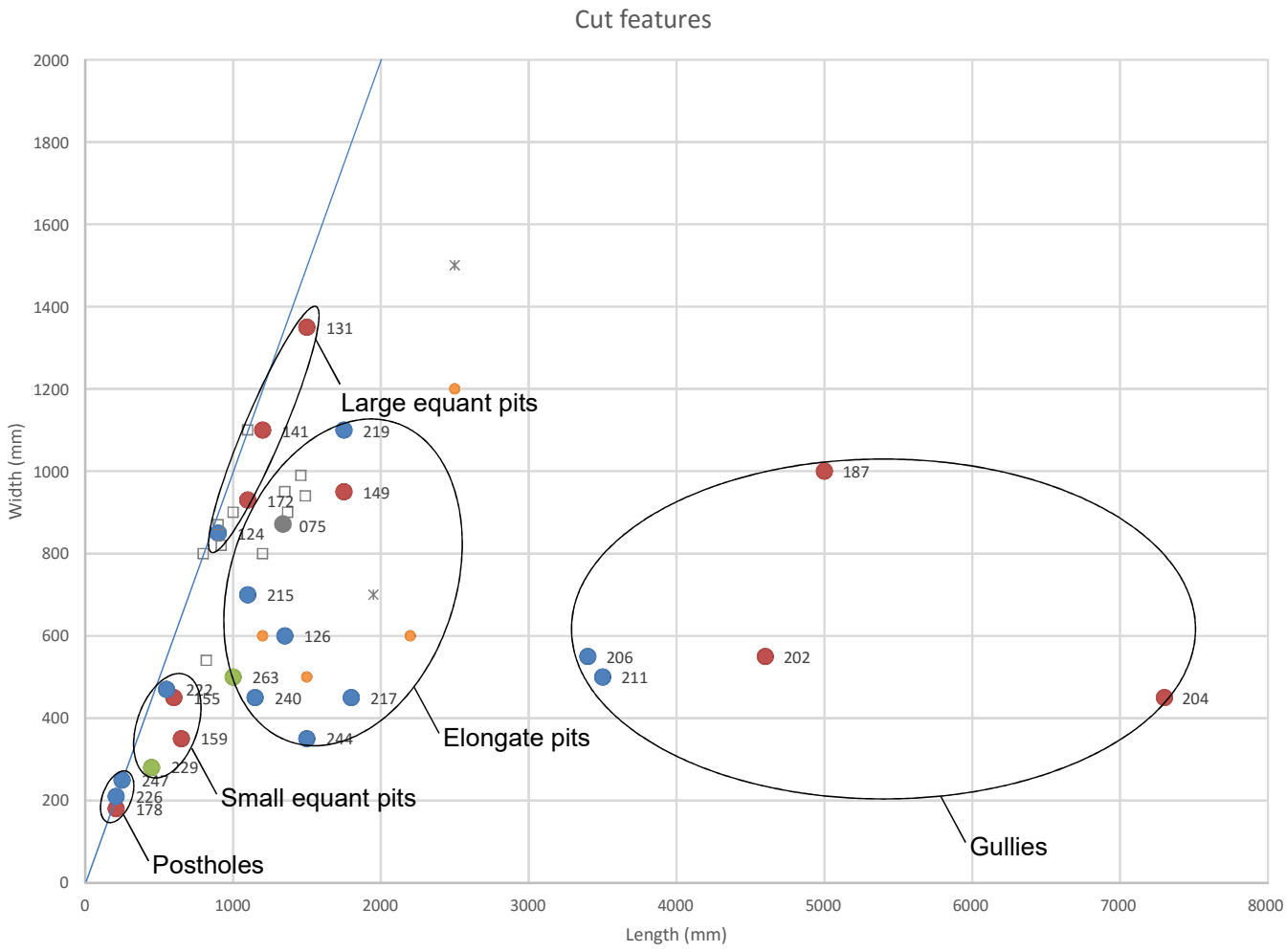


Figure 2


Cut features
Width (mm)
Length (mm)
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
131
141
219
149
172
075
124
215
126
263
222
155
240
217
244
159
229
247
226
178
187
206
211
202
204
Large equant pits
Elongate pits
Small equant pits
Postholes
Gullies

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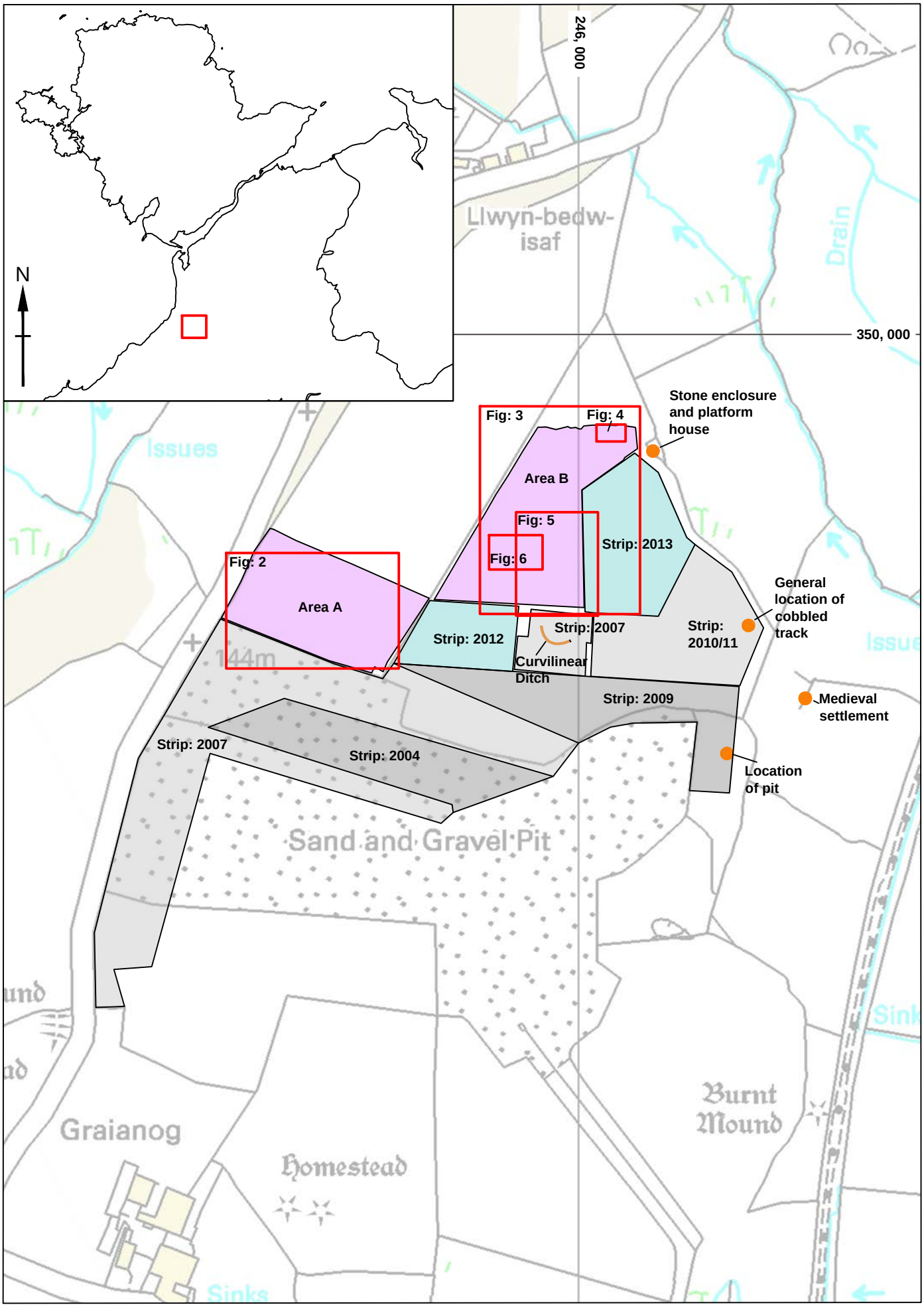

0 100 m

Scale @ A4: 1:2500

Fig. 1: Site Location. Showing Previous Work and Figure Locations

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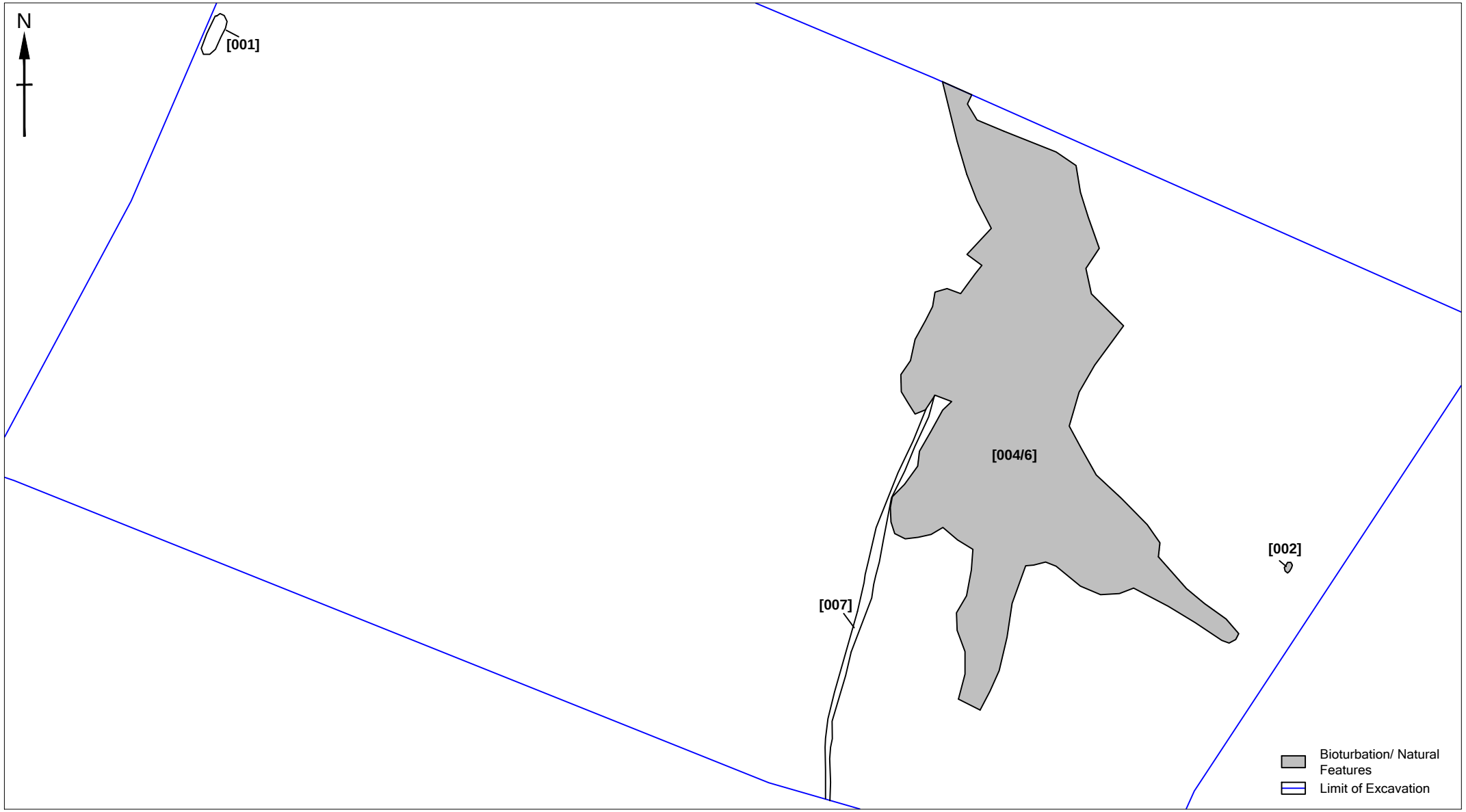

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Fig. 2: Area A Features

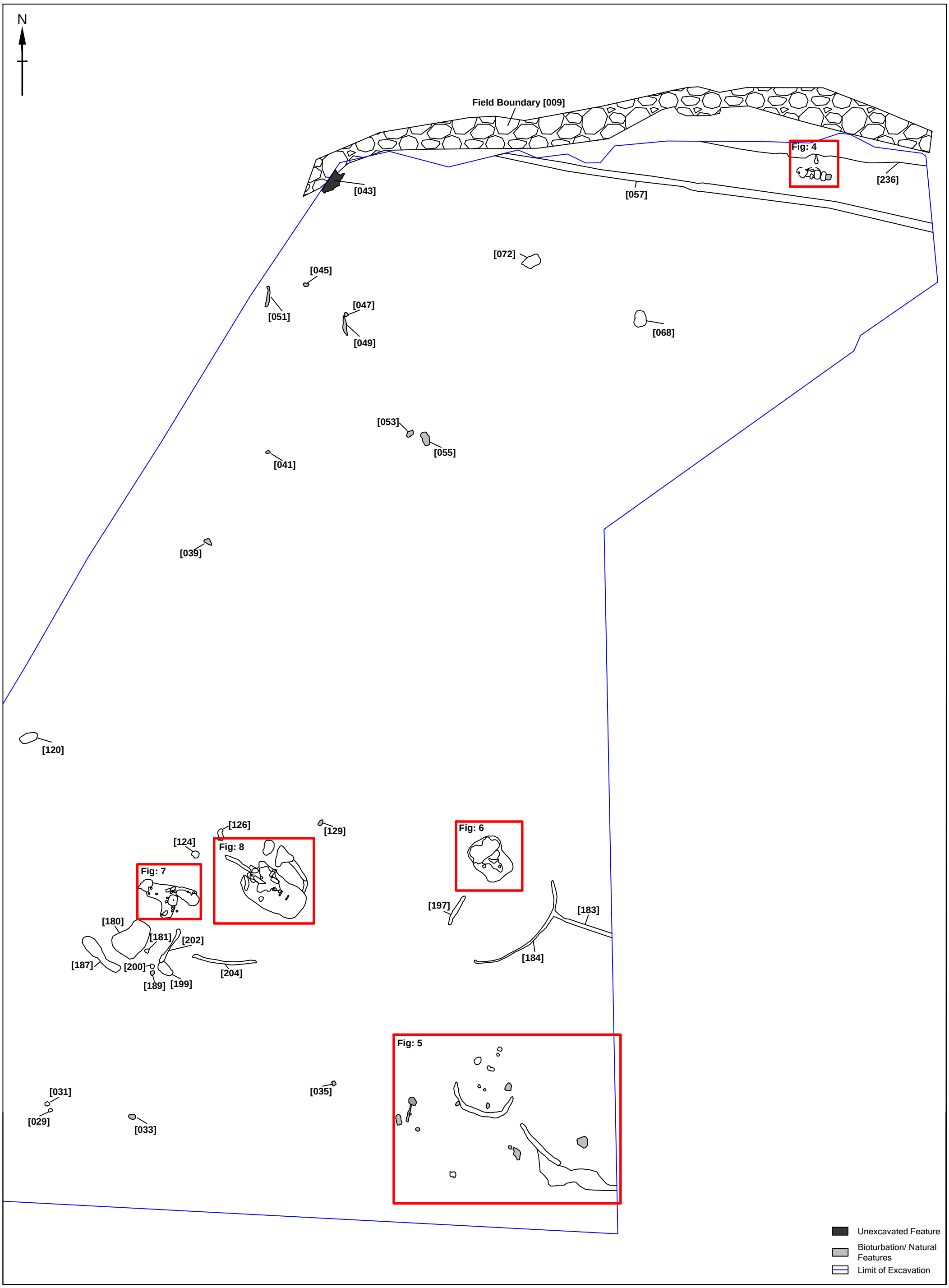

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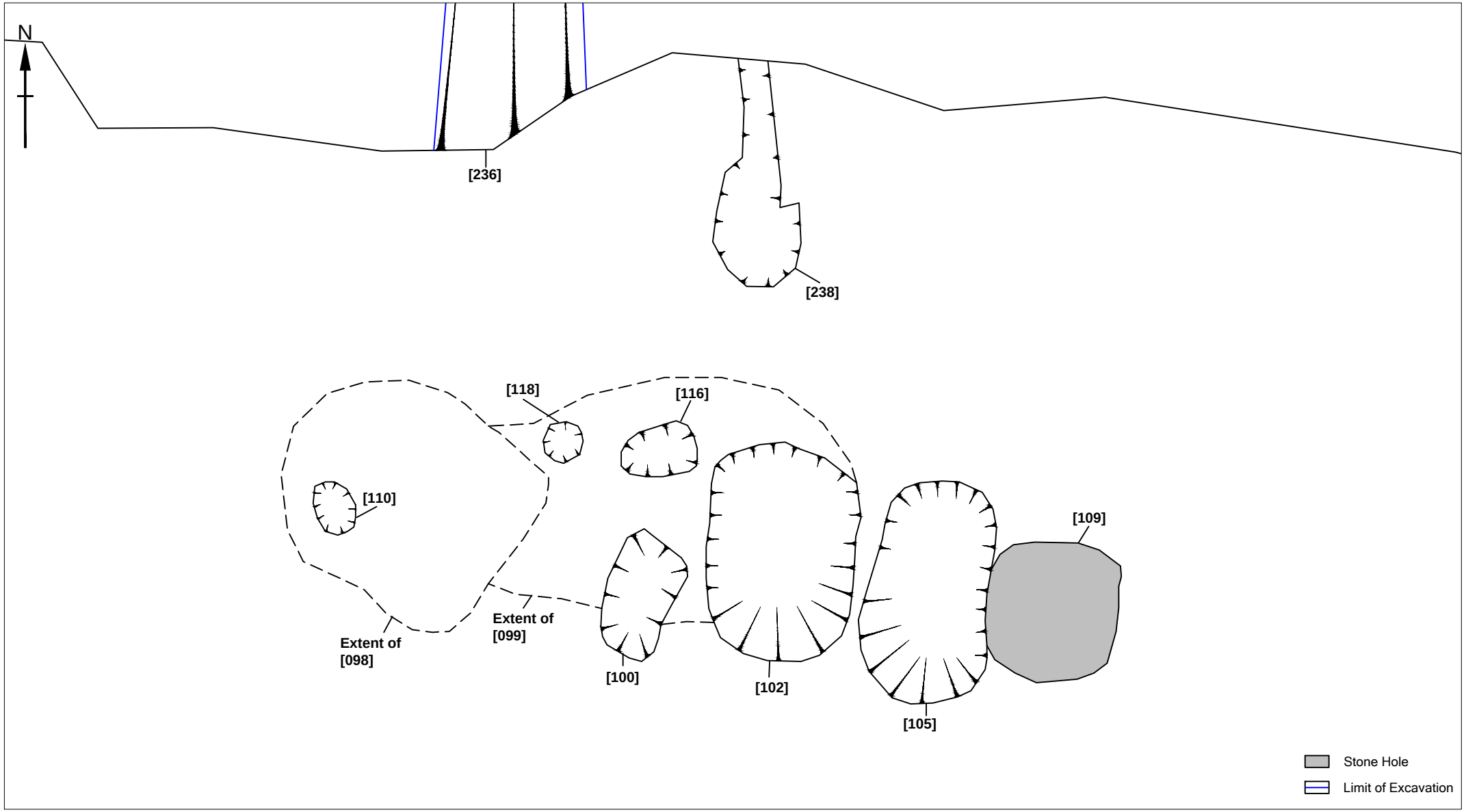
Fig. 3: Plan of Selected Features in Area B Plus Figure Locations



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0 1 m

Scale @ A4: 1:25

Fig. 4: Plan of Features in Northeastern Corner of Area B

N

[011]

[015]

[019]

[021]

[057]

[017]

[094]

[085]

[231]

[083]

[091]

[087]

[089]

[079]

[077]

[028]

[081]

[024]

[026]

[066]

[064]

[070]

Bioturbation/ Natural Features

Limit of Excavation

0 5 m

Scale @ A3: 1:75

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Fig. 5: Plan of Features in Southeastern Corner of Area B

N

[231]

[263]

Extent of [260]

Extent of [228]

[261]

[229]

Platform Edge

0 1 m

Scale @ A3: 1:25

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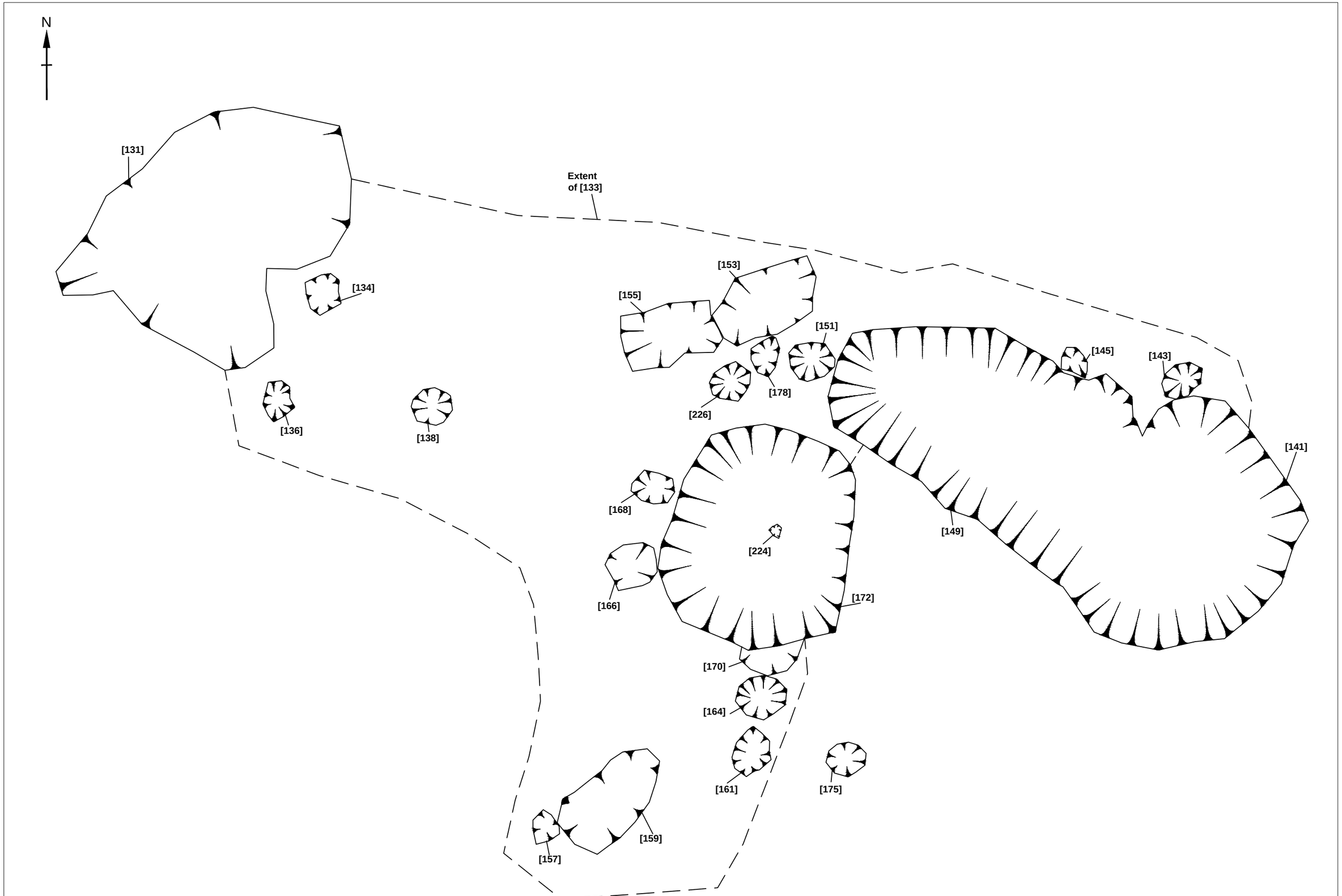
Fig. 6: Plan of Stone Platform [231] and Associated Features



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0 1 m

Scale @ A3: 1:20

Fig. 7: Plan of Sub-Concentration A Features Within Central Area of Area B

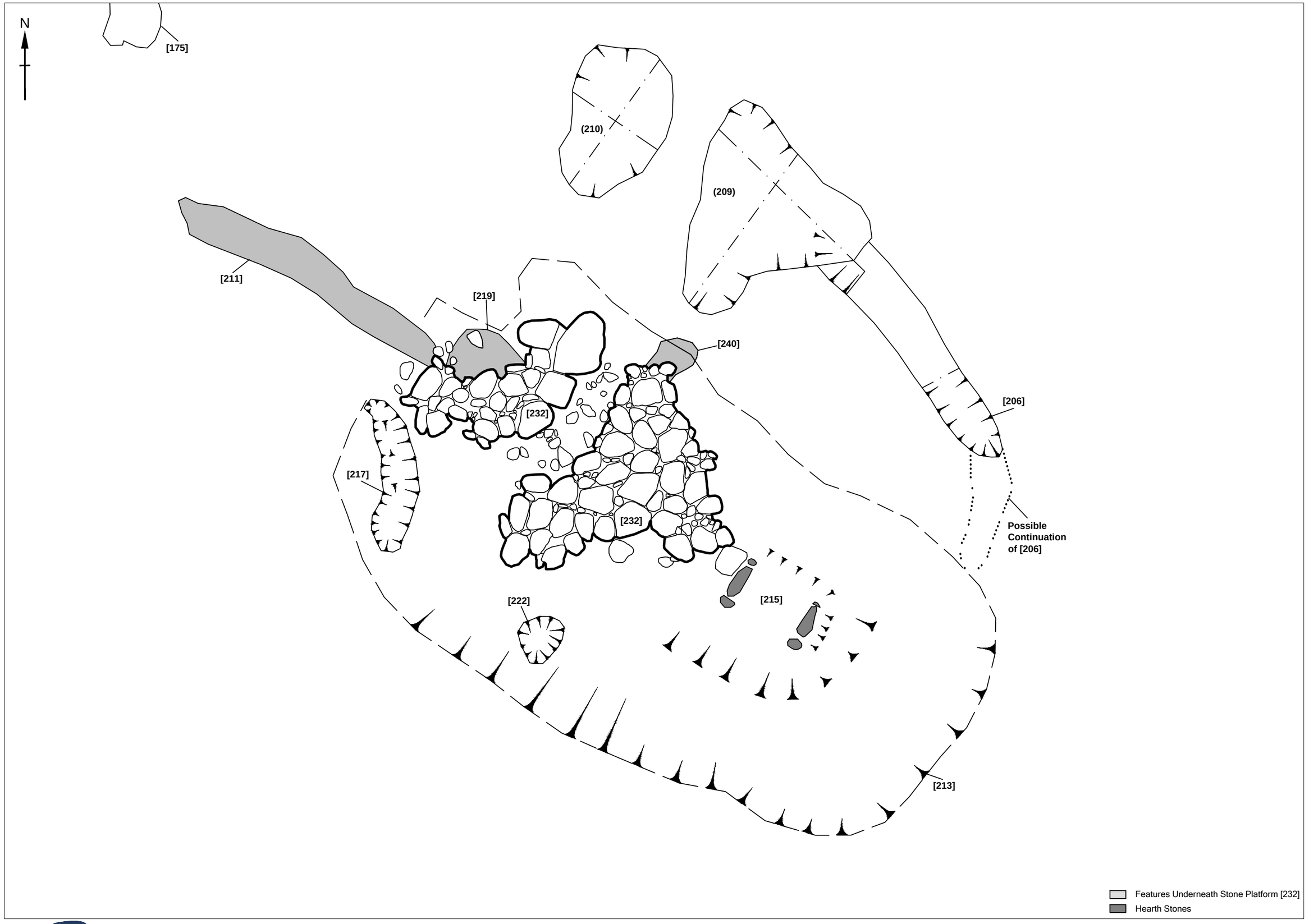

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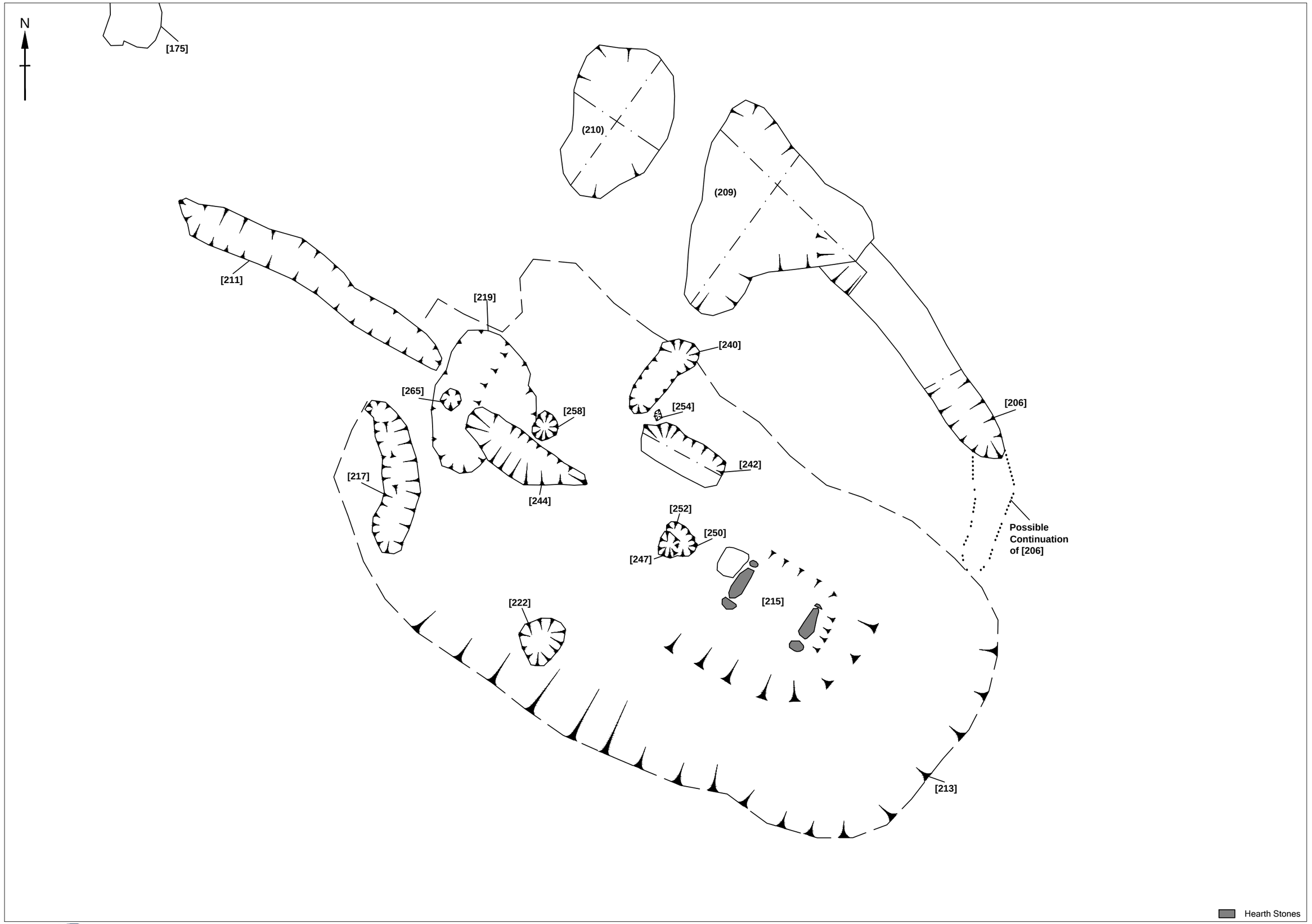
Fig. 8: Plan of Sub-Concentration B Features Within Central Area of Area B



0 2 m

Scale @ A3: 1:40

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Fig. 9: Plan of Features Underneath Stone Platform [232]

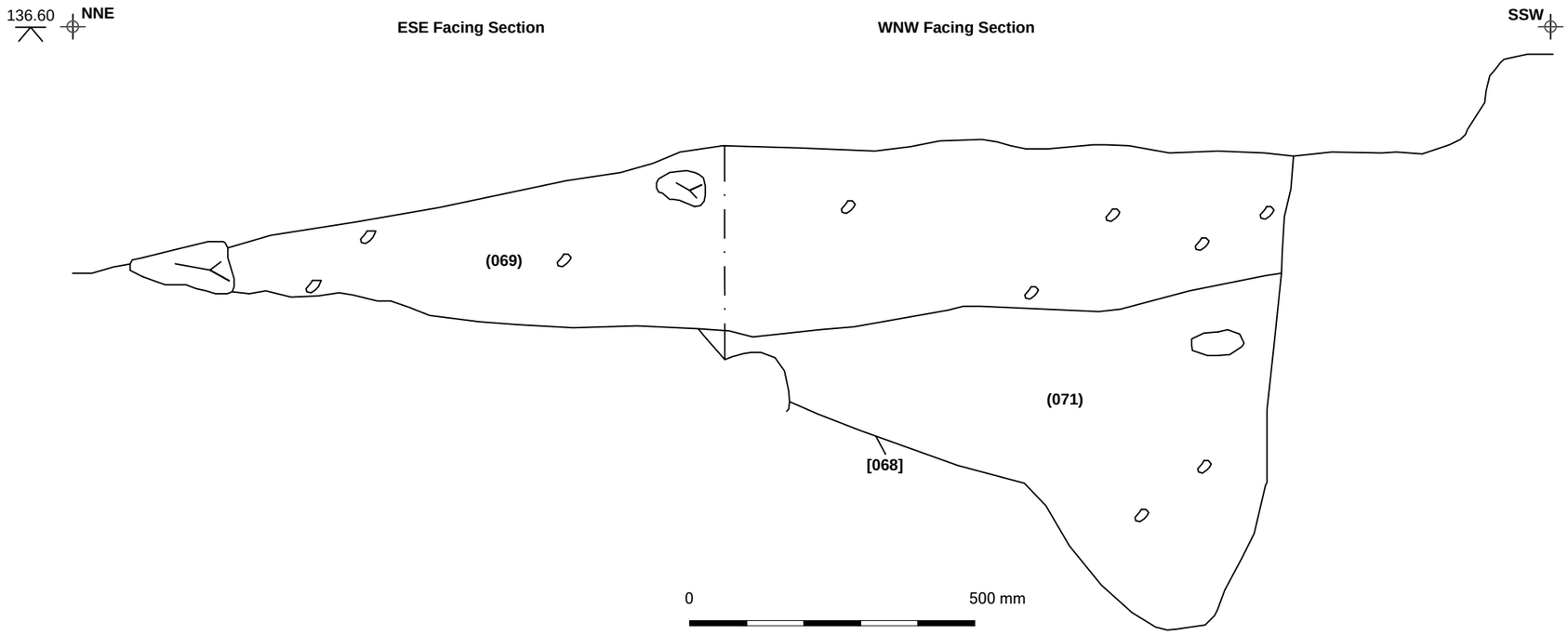


Fig. 10: Pit [068] Section

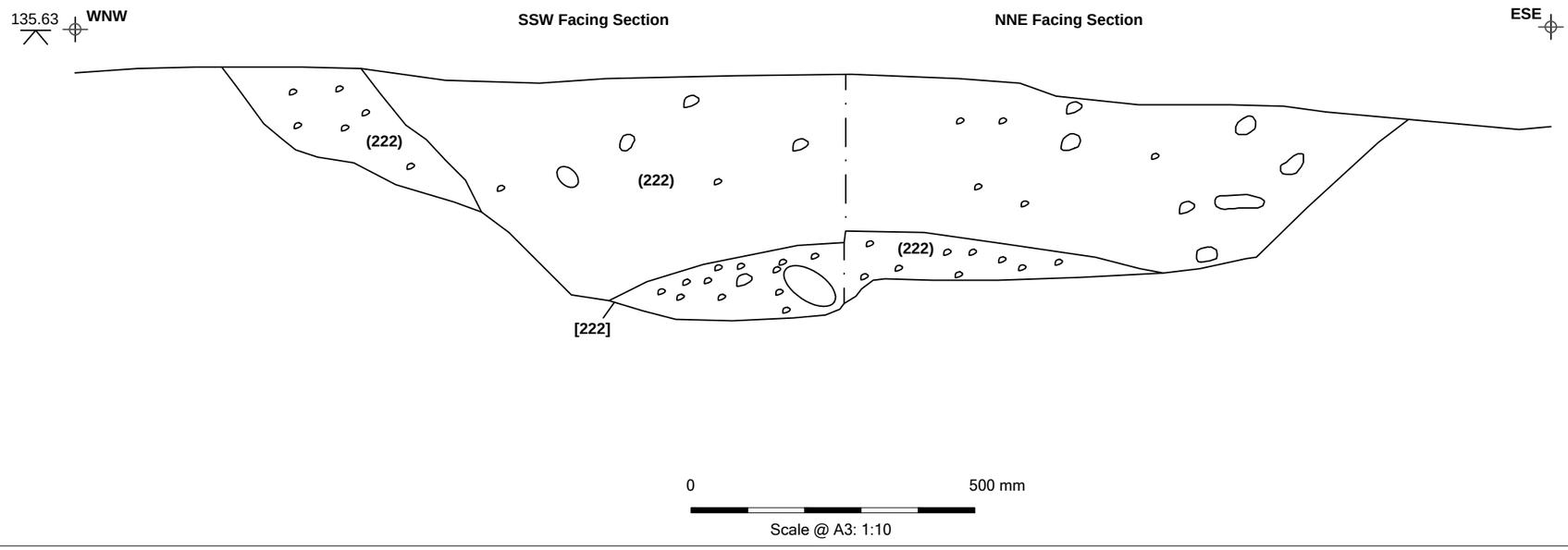
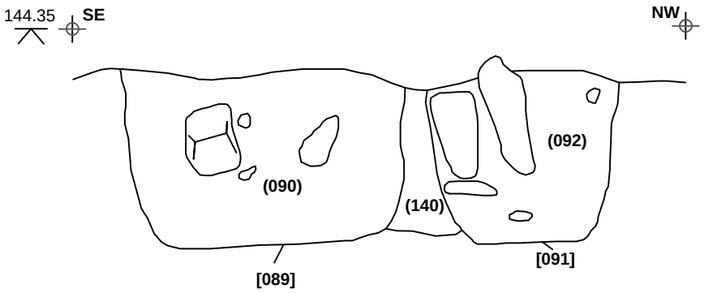


Fig. 11: Pit [072] Section

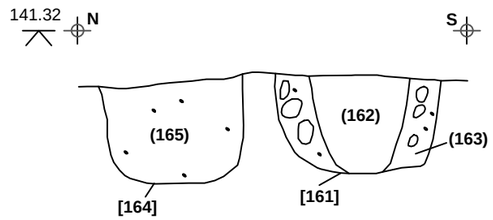


0 500 mm

Scale @ A3: 1:10

Level
Section Point

Fig. 12: Northeast Facing Section of Postholes [089] and [091]

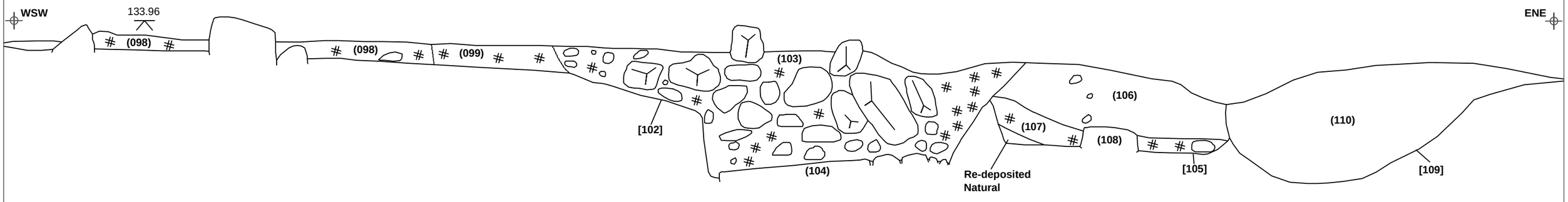


0 500 mm

Scale @ A3: 1:10

Level
Section Point

Fig. 13: West Facing Section of Postholes [161] and [164]



\# Charcoal
Level
Section Point

0 500 mm

Scale @ A3: 1:10

Fig. 14: SSE Facing Section Through Deposits (098) and (099), Pits [102] and [105], and Stone Hole [109]

PLATE 01: MID-EX OF PIT [120]. VIEW FROM THE WSW

PLATE 02: POST-EX OF PIT [072]. VIEW FROM THE WSW

PLATE 03: FIELD BOUNDARY [009]. VIEW FROM THE SOUTH

PLATE 04: PRE-EX OF CONCENTRATION OF FEATURES IN NORTHEASTERN CORNER ((098), (099), [100], [102], [105], [109]). VIEW FROM THE NNE

PLATE 05: STONE BASE (104) IN PIT [102]. VIEW FROM THE NNE

PLATE 06: MID-EX OF PIT [105]. VIEW FROM THE SSE

PLATE 07: POST-EX OF RING DITCH [028], AND INTERNAL FEATURES ([077], [079], [083], [085], [089], [091], AND [231]). VIEW FROM THE NORTH

PLATE 08: STONE PLATFORM [231]. VIEW FROM THE NORTHWEST

PLATE 09: POST-EX OF POSTHOLES [175], [161], AND [164]. VIEW FROM THE SOUTH

PLATE 10: POST-EX PIT [172] SHOWING POSSIBLE STAKEHOLE [224]. VIEW FROM THE WNW

PLATE 11: POST-EX OF PITS [141] AND [149], AND POSTHOLES [148] AND [145]. VIEW FROM THE NNE

PLATE 12: POST-EX OF HEARTH [215]. VIEW FROM THE NE

PLATE 13: STONE PLATFORM [232]. VIEW FROM THE SSE

PLATE 14: POST-EX OF POSTHOLES [247], [250], AND [252], SHOWING POST PACKING (249). VIEW FROM THE NORTHWEST

PLATE 15: SECTION THROUGH PITS [240] AND [242]. VIEW FROM THE EAST

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