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TRANSFER PIPELINE BETWEEN DOLBENMAEN WTW AND CWMYSTRADLLYN WTW

Assessment of Potential for Analysis Report

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

Transfer Pipeline Between Dolbenmaen WTW and Cwmystradllyn WTW

Assessment of Potential for Analysis

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1 INTRODUCTION

Gwynedd Archaeological Trust (GAT) was commissioned by *Black & Veatch Limited* on behalf of *Dŵr Cymru Welsh Water (DCWW)* to undertake a programme of archaeological work prior to, and during the groundworks for the pipeline transfer scheme between the Dolbenmaen Water Treatment Works (WTW) (SH 4986 4926) and the Cwmystradllyn WTW (SH 5471 4286) (Figure 1).

The work was undertaken between February and July 2014 and consisted of targeted trial trenching, a series of watching briefs, and a phase of controlled stripping and evaluation. A project design for the trial trenching along with a written scheme of investigation (WSI) was prepared which sets out the legislation framework and planning background in detail for the archaeological work (Appendix I and II).

The current report was carried out in accordance with the *Management of Archaeological Projects 2* (MAP 2, English Heritage 1990); the *Standards and guidance for the collection, documentation, conservation, and research of archaeological materials* specified by the Institute of Field Archaeologists (IFA 2001); the *standard and guidance for Archaeological Watching Brief* specified by the Institute for Archaeologists (IfA 2008a); and the Institute for Archaeology (IfA) *Standard and Guidance for Archaeological Excavation* (2008). 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 and the updated project design which accompanies this report.

2 SITE LOCATION

The transfer pipeline route is located between Dolbenmaen WTW (SH 4986 4926) and Cwmystradllyn WTW (SH 5471 4286) (Figure 1), and measures *c*.5km in length. The scheme route starts at the Dolbenmaen WTW and runs eastwards for 300m across an open field before turning south for 80m and crossing the Afon Dwyfor. It continues southwestwards for 560m to then run parallel to the south side of the A487(T) road for 190m where it then crosses the A487(T) road, and follows the route of a local road for 550m. Continuing east for 720m it crosses a series of irregular fields before turning southeast for 780m, and then continuing northeast for a further 1.87km to terminate at the Cwmystradllyn WTW. The final c.2km of the pipeline route is located within the Snowdonia National Park.

The geology of the area consists of glacial till over Ordovician extrusive rocks to the southwest and alluvium over undifferentiated Llanvirn Rocks (mudstone, Siltstone, and sandstone) to the northeast (British Geological Survey Mapping).

3 ARCHAEOLOGICAL BACKGROUND

The archaeological background has been discussed in full in the previous archaeological assessment (Richards 2013), and the reader is referred to that document. However, a summary is presented here.

3.1 PREHISTORIC SITES

The proposed route of the water main lies within a rich archaeological landscape with extensive archaeological evidence from many periods. Following the route from west to east, evidence of prehistoric activity and settlement occurs along the whole length of the proposed route. Approximately 700m WSW of the Dolbenmaen WTW stands the probable Bronze Age standing stone of Beudy Cil-Haul (PRN 192, SH 5078 4240). The stone is described as an elongated glacial boulder approximately 1.8m high and 0.8m square, secured with packing stones. Further evidence of prehistoric activity can be found to the northwest of the WTW, a prehistoric burnt mound known as Glan-Dwyfach (PRN 154, SH 4815 4400) is located on the eastern bank of the Afon Dwyfor, approximately 1.3km from the proposed works.

Other prehistoric sites include a stone built prehistoric hut circle (PRN 145, SH 4994 4345). Further to the northeast, approximately 560m north of the A487(T) road is a prehistoric stone built rectangular hut platform (PRN 188, SH 5023 4360). The platform is orientated ENE by WSW and despite some stones existing within the wall face, the majority of the feature has been robbed. Again to the north and approximately 800m from the WTW, close to the modern St. David's church of

Garndolbenmaen, are the remains of a prehistoric hut circle (PRN 150, SH 4999 4387). The hut is cut into the slope to the north and terraced out to the south.

To the south of the WTW on the southern bank of the Afon Dwyfor is an undated hut circle (PRN 160, SH 4981 4234) which may also be prehistoric in date, known as the Ystumcegid-uchaf round hut. Approximately 800m to the southeast of the WTW, again on the southern bank of the Dwyfor, is the Craig-y-Tyddyn hut group (PRN 164, SH 5059 4272), identified by the Gwynedd HER as a hill fort.

The nearest confirmed prehistoric site is a Bronze Age standing stone (PRN 2, 360, SH 5495 4297) at Meini Hirion, approximately 190m southeast of the Cwmystradllyn WTW.

Following the route from west to east, the nearest prehistoric site to the Dolbenmaen WTW is the enclosed hut group of Tyn Caeau (NPRN 145, SH 4994 4345) located approximately 300m north of the WTW, and comprising a rectangular stone building heavily robbed to the northeast, and two hollows representing round huts. Again to the northeast of the WTW is the stone built hut circle of Craig y Llan (PRN 172, SH 5041 4351), the walls of which have collapsed to approximately 2m in width, with the entrance being located either to the NNE or SSW.

To the southeast of the WTW, on the southern bank of the Dwyfor, are two hut groups, the closest being two heavily robbed circular huts (PRN 170, SH 5019 4276), measuring 3.3m and 5m in diameter. Further to the southeast lies the enclosed Romano-British hut group of Craig-y-Tyddyn (PRN 165, SH 5052 4280). The site includes the slight remains of an enclosure wall measuring 30m in diameter, enclosing two roundhouses measuring 8.3m and 4m in diameter.

3.2 ROMAN SITES

A Roman copper cake has been found at Clenenney (PRN 2, 357, SH 5320 4246), approximately 320m north of the proposed route, near the confluence of the Dwyfor and Henwy. A number of such cakes have been found throughout Gwynedd. The final site of known Romano-British origin are the hut circles at Cil Drygwr (PRN 166, SH 5359 4301), approximately 1.2km to the west of the Cwmystradllyn WTW.

The current A487(T) road may follow the line of the Segontium – Pen Llystyn – Tomen y Mur Roman road (general PRN 17553), incorporating sections PRN 17558, SH 4832 4359; PRN 17559, SH 5255 3973; and PRN 17821, SH 5923 3829. This route is discussed in detail in GAT Report 572 (Hopewell 2005) as a route connecting Segontium with the fort at Pen Llystyn and a bathhouse at Tremadog (*ibid.* 12). Within the assessment area, Roman Road Section PRN 17558 is postulated to run along the route of the current A487 from the northwest as far as the junction with the local road to Garndolbenmaen; Section PRN 17559 is postulated to run from the north via the local road through Garndolbenmaen and then the local road through Dolbenmaen to then continue southeast along the A487(T); Section

PRN 17821 is postulated to run across open fields to the northwest as far as the junction with the local road to Dolbenmaen, where it then continues along the current A487(T) route to the southeast, on the same alignment as section PRN 17559. There are currently no traces of Roman road construction along any of these sections.

3.3 MEDIEVAL SITES

The westernmost part of the proposed route lies within the medieval centre of Dolbenmaen in the commote of Eifionydd, and formed part of the medieval township of Dolbenmaen (PRN 7, 341 SH 5060 4300). The current village core is to the east of the WTW. The proposed route passes a number of significant archaeological remains from the medieval period. Again following the route from west to east, these include the site of a medieval long hut at Ty Newydd (PRN 188, SH 5021 4359). A second hut platform is located nearby at Craig y Llan (PRN 184, SH 5042 4353).

Dolbenmaen motte (PRN 161 (SAM CN063), SH 5065 4307) is located to the south of Dolbenmaen. The castle mound and ditch stand on a low ridge running parallel to the river Dwyfor at a fordable crossing point on an important route way. The motte's early history is unclear and it may either be Welsh or Norman built. The possible site of a bailey, if one existed, is now covered by farm buildings and Plas Dolbenmaen (PRN 5, 257, SH 5068 4307) which itself dates to between the 16th and 18th centuries, and may be the location of the royal Llys, later a manor. Tax returns from 1662 shows it to be one of only two houses in the district with two hearths. The First Edition Ordnance Survey records the buildings as the Dolbenmaen Castle public house. The building itself is an early 18th century L-plan building of stone rubble walls under a slate roof framed by tall gable end chimney stacks. The principal elevation is to the northeast and is a two storey four bay front. There are a range of associated outbuildings including a stable, a byre, and a washhouse. Approximately 450m north of the motte is another hut platform at Craig y Llan (PRN 187, SH 5089 4345).

Progressing eastwards along the proposed route, approximately 450m north of the hamlet of Ynys Pandy, is the Clenennau house and barn (PRN 158, SH 5316 4246). The house is believed to be medieval in date. Further upstream on the Afon Henwy there are medieval hut platforms at Cil Drygwr (PRN 182, SH 5370 4294), approximately 550m north of the proposed alignment. Approximately 850m east of Ynys Pandy is the medieval settlement remains at Gesail Gyfarch (PRN 181, SH 5415 4192 centred). The settlement contains at least six long houses and associated agricultural remains.

3.4 PREVIOUS WORK

GAT has recently completed a staged programme of archaeological works for the proposed extension to the existing Dolbenmaen WTW, located at the transfer pipeline start point. The staged programme of works included an archaeological assessment (Richards 2013), an archaeological watching brief during geotechnical

investigation works (Smith 2013), a geophysical survey of the proposed WTW zone (*Stratascan* 2013); a series of archaeological trial trenches targeting anomalies identified during the geophysical survey (McNicol 2013), and a controlled strip of the entire proposed WTW zone (McNicol 2015).

The archaeological works at the Dolbenmaen WTW revealed a total of 74 archaeological features dating from the prehistoric to the modern period. These included a large number (58) of pits and postholes and three probably prehistoric ring ditches (McNicol 2015).

A geophysical survey, using a magnetometer, was completed by *Stratascan* in February 2014 (*Stratascan 2014*) along the route of the proposed pipeline. The survey covered an area of approximately 16.2ha consisting of a 30m corridor along the 5.42km route of the pipeline. Some areas of the route were unsurveyable due to protruding rocky outcrops. A number of features of possible archaeological origin were identified, predominately towards the western end of the pipeline route. These included a number of linear and curvilinear cut features along with evidence of ploughed out embankments and earthworks.

4 AIMS AND OBJECTIVES

The original aim of the programme of work was to identify any archaeological remains revealed prior to, and during the groundworks. Appropriate mitigation measures were developed for all archaeological remains revealed.

The purpose of post-excavation work is to ensure appropriate analyses are undertaken, that site records are studied, compiled, and that a coherent report on the results is produced with appropriate illustrations. It also involves ensuring that site records, both paper and digital, are in a format suitable for long term storage.

The original aims of the archaeological works were to:-

- verify the efficacy of the geophysical survey for identifying archaeological remains within the site;
- 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 TRIAL TRENCHING

The archaeological trial trenching targeted anomalies identified in the magnetometer survey and features seen on the Lidar data. All of the trenches were located within the working areas of the scheme and varied in shape and dimensions (tailored to the targeted features) (Figure 1).

5.2 CONTROLLED STRIPPING

An archaeological controlled strip was carried out for the following construction stages:

- the topsoil stripping within the compounds and at all turning points;
- the 13.8m wide topsoil strip within the easement;
- the 4.8m wide transfer pipeline trench down to the archaeological horizon;
- the directional drilling zone to cross Afon Dwyfor;
- and the 50mm Dolbenmaen village branch pipeline, from Dolbenmaen WTW as far as the A487(T) crossing point

5.3 WATCHING BRIEF

An archaeological watching brief was maintained for the following construction stages:

- the 50mm branch pipeline along Dolbenmaen village road;
- the crossing of the A487(T) road;
- all instances of minor intrusive works, including 5No pipeline cross connections that will connect the transfer main to existing smaller diameter branch pipes, replacing the existing set up for the 18” main.

5.4 AUGER SURVEY AND CORING

The whole of the pipeline route was walked and the ground probed using a 1.2m pointed stainless steel probe at all locations where peat deposits potentially occurred, largely recognised by the vegetation they carried and soft ground conditions. At each of these locations the stainless steel probe was pushed into the ground at several points to establish the depth of sediments. All locations where the soft sediments were established at over 0.4m depth were flagged for subsequent hand augering, all areas where the probe hit underlying stones or clays in less than 0.4m were ignored and the probing survey moved on.

At the eleven areas which had been flagged for hand augering and more detailed evaluation of the soft sediments a series of points, generally at 5 or 6m intervals, were laid across each area of peats within the pipeline easement and subsequently hand augered, with the deposits at that location recorded using standard deposit recording.

Eight of the eleven transects were chosen for sampling and the deepest deposits recorded during the hand augering of each transect selected for core sampling. Core sampling was undertaken using a 110mm diameter plastic earth pipe cut down to the size appropriate for that core. The pipe was driven by hand vertically into the soft peats for the full depth recorded during the auger survey. A slot was then dug on one side of the pipe and the pipe removed with the core intact inside it. Both ends were sealed with gaffer tape and the pipe labelled. At four locations the sediments were too deep for the whole sequence to be recovered in the earth pipe.

At these locations the upper approximately one metre of deposits were recovered in an earth pipe and a Russian auger used to recover the sequence of peats and sediments below this depth.

5.5 FIELDWORK

All works were carried out in accordance with the Project Design and/ or the Written Scheme of Investigation (WSI) for the works (Appendix I and II) 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 features were half sectioned in order to record the stratigraphy and then excavated in full. All sections were drawn at a scale of 1:10.

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. Hand drawn plans were produced at a scale of 1:20 where appropriate and also tied into the National Grid.

Bulk soil samples (a minimum of 10 litres and maximum of 40 litres) were taken for flotation of charred plant remains. These bulk samples were taken to allow the recovery of both charred plant remains and small artefacts not easily recovered by hand.

5.6 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	359
Drawings	58 drawings on 14 sheets
Digital photographs	1179

Environmental Samples

Total Samples: 41 x 10 litre tubs from 26 contexts

Finds

Stone	8
Metal	3
Pottery	7
Total	**18**

7 FIELDWORK RESULTS

7.1 INTRODUCTION

This section provides a summary of the results of the archaeological work. A total of 98 features were recorded, dating from the prehistoric to modern period, along with 63 upstanding post-medieval field boundaries (Figure 1).

The majority of the features uncovered were concentrated in three areas: Field 1, Field 9, and Field 39, with the remaining features spread out throughout the site (Figure 4). These are discussed by area below. For a detailed description of all the features and deposits uncovered during the archaeological works see Appendix III.

Field 66 was located at the western end of the current Dolbenmaen WTW, and was excavated as part of a carpark extension to the pipeline compound in this area. Due to its location, this field and the two ditches uncovered within it (**66001** and **66004**) were discussed in the report on the Dolbenmaen WTW works (McNicol 2015).

7.2 SUMMARY

A total of 20 archaeological trial trenches were excavated across the site (Figure 1) specifically located to target anomalies shown up by the geophysical survey. Only eight features were uncovered within the trial trenches, and these will be discussed below along with the other features uncovered during the controlled stripping.

A controlled topsoil strip was to be carried out on a c.13.8m wide strip of the entire length of the easement route, along with the three compound areas. However, during the works this changed to a wider strip of land (c.18-21.8m wide) along the majority of the easement route (Figure 2).

A controlled strip down to the archaeological horizon was carried out on a c.4.8m wide strip of land along the entire length pipeline route as well as the within the footprint for the directional drilling works. This was changed to a full width strip within a number of areas along the pipeline route during the groundworks (Figure 3).

A watching brief was maintained during the construction of the 50mm branch pipeline along the Dolbenmaen village road; the crossing of the A487(T) road; the construction of the transfer spurs connecting the main pipeline to existing, smaller branch pipelines; and the excavation of the pipe trench within areas of deep peat deposits where a controlled strip was not possible (Figure 1).

No features were uncovered during the various watching briefs undertaken throughout the scheme or during the topsoil stripping. However, archaeological features may still survive in these areas which were undisturbed by the groundworks.

The controlled strip along the length of the pipeline, along with the further excavation areas will be discussed together and will be hereafter referred to as the site. The site comprised of a strip of land, between 5m and 22m wide, running for approximately

5km. The ground was a mix of upland pasture and the topography was mostly sloping, with some steeper slopes in places. The natural geology comprised of a light to mid brown sandy loam with large areas of gravels dispersed throughout. All features uncovered were cut into the natural geology and sealed by a layer of subsoil unless stated otherwise.

7.3 FIELD 1

At the western end of Field 1 a small circular pit (**01013**), measuring 0.65m in diameter and with a depth of 0.15m was uncovered (Figure 5). It was filled with a single greyish brown clayey silt deposit containing a large amount of stones (**01014**), suggesting that this may have been a deliberately dumped deposit. Directly to the east of this pit, a larger, sub-oval pit (**010150**) was uncovered measuring >2.35m by 2.6m. A large natural boulder was located within this feature and it is likely that the pit was created as an attempt to remove this stone, but upon failure to do so, the hole was backfilled with a deliberately dumped deposit of stones (**01016**).

Further to the east, a large curvilinear ditch (**01001**) was uncovered running in and out of the southern limit of excavation (Figure 7, Plate 1). The exact shape of the ditch is uncertain, however both ends appear to be curving round and the ditch may have enclosed a sub-circular or sub-rectangular area. The ditch had fairly steep sides with a concave, almost V-shaped base (Figure 12), and measured approximately 2.3m wide with a maximum depth of 1.38m. Four sections of the ditch were excavated (Figure 7) which revealed it was filled with on average seven to eight deposits (Figure 11, Plate 2), the majority of which were most likely the result of natural silting up. However three distinct episodes of possible deliberate backfilling were observed within all the sections. An initial stony deposit (**01018**, **01025**, **01047**, and **01066**) between 0.2 and 0.4m thick was located near the base of each ditch section. A further stone rich deposit (**01002**, **01005**, **01045**, and **01062**), on average 0.38m thick was located near the middle of the sequence of backfilling in each of the ditch sections excavated. Near the top of each of the ditch sections excavated, a final stony deposit (**01003**, **01004**, **01006**, and **01054**) was revealed measuring on average 0.27m thick. Due to the high concentration of stones within these deposits it is likely that they represent three separate, but deliberate, backfilling events, possibly as part of ongoing field clearance in the area.

A small, roughly square pit (**01069**) was revealed possibly truncating the outer edge of enclosure ditch **01001** (Figure 7). However both the upper fill of the pit (**01067**) and the deposit located at the edge of the ditch in this area comprised of a very similar greyish brown clayey silt deposit, and therefore the exact nature of their relationship is uncertain. The pit measured 0.95m by 0.86m, with a depth of 0.2m and was filled with two distinct deposits. The basal fill comprised of a charcoal rich in-situ burning deposit (**01068**) 0.07m thick. This was sealed by a 0.13m thick greyish brown clayey silt deposit (**01067**), most likely representing natural silting up of the pit after it had gone out of use.

A small linear gully (**01070**), aligned roughly east-west, was uncovered running for approximately 5m alongside the northern side of enclosure ditch **01001** (Figure 7). The gully had fairly steep sides with a concave base and measured 0.65m in width with a maximum depth of 0.25m. It was filled with a single greyish brown sandy silt deposit (**01071**) and was truncated by a circular pit (**01053**) towards its eastern end. A similar gully (**01073**) was revealed continuing along on the same alignment from the western terminus of gully **01070**, and it may be that this represents a shallower and more heavily truncated continuation of the same feature. This gully measured between 0.2 and 0.5m in width with a maximum depth of 0.1m and ran for approximately 5.5m before petering out. Pit **01053** which truncated gully **01070** was circular in shape with a diameter of 1.1m and a depth of 0.45m. The main fill of this pit consisted of a dark brown silty sand deposit (**01052**), 0.45m thick. Two layers of re-deposited natural (**01050** and **01051**) were uncovered sealing this deposit at the southern edge of the pit.

Four postholes (**01017** (Figure 13), **01032**, **01040** (Figure 13), and **01042**) (Plates 3 and 4) were revealed towards the southern limit of the excavation area within the area enclosed by ditch **01001** (Figure 7). All four postholes were approximately 0.3m in diameter with a depth of between 0.25m and 0.39m, and were filled a mid-dark brownish grey stony clayey silt deposit (**01031**, **01033**, **01041**, and **01043** respectively). Given their similarity and proximity to each other it is likely that they are contemporary, and may indicate the presence of more archaeological activity close by within the unexcavated area directly to the south.

A further three features were uncovered in the area between ditch **01001** and the group of four postholes (Figure 7). However, upon excavation two of these were shown to be the result of bioturbation (**01034** and **01038**), while the third (**01036**) was most likely a modern posthole due to its very loose fill (**01037**).

To the east of these features a linear ditch (**01010**) aligned NNE-SSW, was uncovered measuring approximately 1.3m in width and with a maximum depth of 0.27m (Figure 6). It was filled with a single dark reddish brown silty loam deposit (**01011**/ **01012**), and most likely represents an old field boundary.

Towards the eastern end of Field 1 a further five pits and two linear ditches were uncovered during the archaeological works. Two of the pits (**01100** and **01107**) contained post-medieval material and were therefore not fully excavated. The remaining three pits were all roughly oval in shape and measured between 0.65m by 0.4m and 1.2m by 1.9m, with depths of between 0.13m and 0.4m. The fills of pits **01101** and **01102** were both very loose (**01108** and **01104** respectively) suggesting that they were fairly modern in date. Pit **01103** was filled with a single charcoal rich deposit (**01105**), however, given its shallow nature (0.13m deep) and uneven base and edges it is possible that this feature represents a burnt out tree bowl. The two linear ditches (**01109** and **01111**) uncovered were both located within the pipeline spur excavation area within Field 1. Ditch **01109** measured 0.8m in width, with ditch

01109 measuring 1.14m wide, and both had an approximate depth of 0.14m. They were both filled with a single mottled greyish brown clayey silt deposit (**01110** and **01112** respectively). The ditches were aligned approximately north-south and were located adjacent to each other. These ditches were not visible within the main area of Field 1 to the south, and it is likely that they either terminated or turned prior to this area.

7.4 FIELD 9

At the northwestern end of Field 9 the remains of a small wall (**09032**), aligned northwest-southeast, were uncovered (Figure 6, Plate 5). The wall measured approximately 0.6m in width and was set within a shallow depression/ cut (**09031**). It appeared to turn to the northeast at its southeastern end, however at this point a modern pit (**09029**) truncated the wall. A modern pit (**09034**) was also revealed truncating the northwestern end of the shallow depression/ cut (**09031**) which the wall sat within. A fragment of post-medieval pottery was recovered from the single fill of the depression/ cut, suggesting that the wall dates to this period.

Roughly on the same alignment as the wall, but possibly curving towards the west and south at its northwestern and southeastern ends respectively, a cobbled road (**09026**) was revealed running for approximately 27m. Large flat stones had been laid along both sides of the cobbled road to form the edges (Plate 6), although some of these had been removed, most likely by ploughing. The stones were sealed by a compacted gravel surface (**09026**) which was also visible along the outer edges of the road (Figure 6). Both ends of the road appear to have been truncated at some point, with the southeastern end most likely the result of ploughing, whereas the northeastern end was truncated by a modern water pipe and was also probably affected by ploughing within this area. A section in the middle of the road had also been truncated by a large modern pit (**09027**) which had been created as a stone dump when the field was cleared. A small concentration of stones (**09030**) was uncovered at the southwestern end of the road and these may represent the heavily ploughed out remains of the road. However, no gravel surface was visible in this area, and they may purely be a natural concentration. Three iron horseshoes were recovered from beneath the cobbles, which suggests that the road dates to either the medieval or post-medieval period. Given the close proximity of the wall and the road, it is probable that they were contemporary, and given the post-medieval date of the wall, then it is most likely that the road also dates to this period.

A further 20 features were uncovered within this area during the archaeological works, however upon excavation nine were revealed to be bioturbation (**09003**, **09005**, **09007**, **09023**, **09048**, **09050**, **09053**, **09054**, and **09057**), three to be the remains of furrows (**09047**, **09049** and **09058**), two to be related to post-medieval drainage (**09011** and **09041**), one to be a stone hole (**09051**), and one to be a post-medieval stone dump (**09055**). The remaining four features consisted of a probable post-medieval field boundary ditch (**09009**), and two possible pits (**09019** and

09021). Ditch **09009** was located towards the southeastern end of Field 9 and measured 2.8m in width with a depth of 0.1m. A thin greyish brown clayey silt deposit (**09018**) was located at the base and against the sides of the ditch. This was sealed by a light bluish grey sandy silt and gravel deposit (**09010**).

The two possible pits were located to the southeast of the cobbled road (**09026**), with pit **09019** consisting of a roughly square pit filled with a charcoal rich deposit (**09020**) and showing signs of in-situ burning. The pit was located cut into the single dark reddish brown clayey silt fill (**09022**) of irregular shaped pit **09021**. Given its irregular nature, and probably heat affected fill, it is likely that this feature represents a natural depression which has had a small fire pit dug into it.

7.5 FIELD 39

At the northwestern end of Field 39 a rough stone platform (**39001**) was uncovered (Figure 9, Plate 7). It measured approximately 5.8m by 4.1m, and was constructed from a single layer of sub-rounded and sub-angular stones set randomly into the natural.

Three circular pits (**39005**, **39011**, and **39014**) were uncovered to the ESE of the stone platform within Field 39. Pit **39005** measured 2.81m by 2.3m, with a depth of 0.76m and was filled with five naturally silted up deposits (**39006**-**10**). Pits **39011** and **39014** measured approximately 1.8m and 1m in diameter respectively. A single fragment of post-medieval pottery was recovered from the upper fill of pit **39011**, a greyish brown clayey silt deposit (**39012**). This sealed a thin re-deposited natural layer (**39016**) located at the base of the pit. Pit **39014** was filled with a single greyish brown clayey silt deposit (**39013**), 0.18m thick, and was most likely the result of bioturbation rather than a manmade feature.

At the southeastern end of Field 39 a curvilinear ditch (**39002**) was revealed running downhill from the SSE to the NNW, before turning northeast. A stone field drain (**39004**) was visible within this ditch, and it is likely that they are both part of the same drainage system. Another stone drain (**39021**) was uncovered running southeast-northwest in this area, and may have fed into this same ditch, although disturbance in this area means that a relationship between them is uncertain. Stone drain **39021** truncated a large burnt spread (**39015**) as well as running alongside stone concentration (**39027**) (Plate 8). The stone concentration (**39027**) was only partially revealed as it continued outwith the limits of the excavation, however, it measured at least 3.7m by 1.9m and was approximately 0.1m thick.

The burnt spread (**39015**) was partially sealed by the stone dump (**39027**) and measured approximately 2.7m by 2.1m, with an average thickness of 0.2m. It consisted of a black silty sand deposit with large amounts of heat affected stones (Figure 11). There was no evidence of in-situ burning, although the layer below this spread (**39034** and **39037**) is most likely the result of the natural geology being heated up by, and mixed with, this dump of burnt material. Two pits (**39017** and

39019) were partially sealed by the burnt spread, and both were partially truncated by the stone drain **39021**. Pit **39017** was sub-rectangular in shape, measuring 1.1m by 1.05m, and with a depth of 0.33m. It was filled with three distinct deposits; a greyish reddish brown clayey loam deposit (**39033**) located against its southeastern side; a greyish brown silty clay deposit (**39018**) containing a quantity of burnt stone; and a loose brownish grey clayey silt deposit (**39032**) which most likely derived from burnt spread **39015**.

Pit **39019** was only partially revealed in this area as it continued outside of the excavation area, and therefore its exact shape and size is uncertain. However, it measured at least 2.3m by 1.2m and was filled with three distinct fills (**39023**-**5**). The basal fill (**39023**) consisted of a thin brownish grey silty sand deposit most likely representing the initial silting up of the pit after digging. This was sealed by a 0.6m thick layer of dark brownish black clayey silt (**39024**) with frequent burnt stones and charcoal, most likely representing a deliberate dump. A light brownish grey sandy loam (**39025**) was visible sealing this deposit, representing the final silting up of the pit after it had gone out of use.

7.6 Rest of Site

Within Field 4 a large organic peaty deposit (**04003**) containing natural pieces of timber was revealed. This most likely represents a natural peat deposit, one of many seen throughout the site. Adjacent to this was a thin burnt spread deposit (**04004**), most likely representing a burnt out tree bowl.

A stone trackway (**05001**) approximately 2m wide and aligned ENE-WSW was revealed within Field 5. Its location, just underneath the topsoil, and running towards the remains of a stone bridge over the adjacent river suggests that it is fairly recent feature.

Excavation within Field 10 revealed three features, two possible pits (**11002** and **11005**) and a tree bowl (**11003**). Pit **11002** was roughly oval in shape, measuring 0.8m by 0.6m, and with a depth of 0.14m. It was filled with the same overlapping deposit as adjacent tree bowl **11003**, a brownish grey silty clay (**11001**), suggesting that this feature was also created by bioturbation. The full extent of possible pit **11005** could not be seen as it was truncated by a test pit and also appeared to continue outwith the excavation area. It was irregular in shape with a maximum depth of 0.45m and measured >1.72m by 1.32m. A large concentration of stones was visible within the mottled reddish brown and brownish grey clayey silt fill (**11004**), which may suggest that this feature represents a stone dump.

A modern spread of stones (**14001**) was uncovered within Field 14 running parallel to the road and most likely laid down either as clearance or to create a firmer trackway through the field as large patches of peat were visible within this area of the site.

Excavation within Field 15 revealed a number of features, however upon excavation the majority of these features were shown to be either modern (**15001**, **15003**, **15006**, **15012**, and **15013**) or natural (**15008**, **15010**, and **15011**). The only exception was a possible posthole (**15004**) which was circular in shape with a diameter of 0.5m and a depth of 0.14m. It was filled with a fairly loose stony greyish brown clayey silt (**15005**) and was located close to modern square posthole **15006**. The lack of any other features nearby, except for the modern posthole, along with the looseness of the fill would suggest that this was a fairly modern feature as well.

A single curvilinear ditch (**18003**) was uncovered within Field 18 running southeast-northwest before curving round to the west and then curving back to the northwest. It measured approximately 1.4m in width with a depth of 0.37m and was filled with three distinct deposits (**18001**, **18002**, and **18006**). The basal fill consisted of a 0.13m thick gravelly silt (**18002**) which was sealed by a 0.08m thick layer of bluish grey clayey silt (**18001**). This was in turn sealed by a reddish brown silty clay (**18006**), 0.16m thick. The meandering nature of this ditch would suggest it was most likely used as a drainage ditch.

Within Field 20, a post-medieval stone trackway (**20001**) was uncovered during the archaeological work, running from the existing farm track through the field and up to a stone crossing over the stream. No other archaeological features were uncovered within this field.

A small sub-oval pit (**27002**), measuring 0.74m by 0.47m was uncovered within Field 27. It had a depth of 0.11m and was filled by a single dark brownish black clayey silt deposit containing charcoal flecks (**27001**). No other features were located close by, and it is possible that this feature represents burnt out bioturbation.

Further to the east, two intercutting features (**27003** and **27005**) were revealed. Feature **27003** was irregular in shape, with uneven sides and base, and was most likely created by bioturbation. Pit **27005** was sub-rectangular in shape, measuring 2.65m by >0.77m and with a depth of 0.65m. It contained three distinct fills (**27010**, **27011**, and **27012**) and was shown to cut through the subsoil, dating in to the post-medieval period.

Two linear ditches (**29002** and **29004**) were revealed running parallel to, and either side of, field boundary **29** which they are most likely related to and contemporary with. They measured 1.7m and 2.1m in width respectively with an average depth of 0.39m, and were filled with a single brownish grey clayey silt (**29001** and **29003** respectively).

A possible linear ditch (**32006**) was uncovered running along the edge of Field 32 and most likely related to the parallel field boundary wall. A post-medieval drain (**32004**) was also uncovered cutting through the subsoil and running roughly parallel to this ditch within this field.

Two post-medieval drainage ditches (**42001** and **42003**), running downhill from the south to the north were uncovered within Field 42. These could be seen as depressions within the field to the south, and were shown to have come from the same ditch before splitting into two, just before entering Field 42. Both ditches measured approximately 1.1m in width with a depth of 0.2m and contained a single dark brown peaty silt deposit (**42005** and **42004** respectively).

A small possible posthole (**42006**), measuring 0.46m by 0.38m, with a depth of 0.26m was uncovered to the west of these drainage ditches. It was filled with a greyish brown clayey silt deposit containing charcoal flecks (**42007**). No other features were uncovered within this area, and it is possible that this feature represents burnt out bioturbation rather than a posthole.

Four post-medieval drainage ditches were uncovered within fields 43 (**43001**), 44 (**44001** and **44003**), and 48 (**48002**). A small concentration of stones (**44002**) which was most likely natural was recorded within Field 44, while a natural spring (**45001**) was revealed within Field 45. Two linear ditches (**48004** and **48005**) were also uncovered within Field 48. Both were aligned northwest-southeast and measured approximately 1m in width. Ditch **48004** was 0.3m deep (prior to truncation during the controlled strip) and filled with a reddish brown silty sand deposit (**48003**), while ditch **48005** was 0.36m deep and filled with a light greyish brown silty clay deposit (**48006**). Given their close proximity to each other and similar alignment, then it is likely that these ditches are contemporary, and most likely represent part of the same boundary or drainage system.

At the southwestern end of Field 50, the remains of a wall (**50001**) (Figure 10) were uncovered. The wall was aligned roughly east-west and ran for approximately 6m from the edge of the excavation area until it petered out to the east. It was 1m wide, with a maximum height of 0.5m and was on average only one to two courses high, and constructed from randomly place sub-angular stone..

Towards the northeastern end of this field, a modern dump of slate (**50002**) was revealed at the edge of the excavation area. Close to this, a slightly curvilinear ditch (**50004**) was revealed, aligned northeast-southwest, and measuring 2.6m in width with a depth of 0.2m. It was filled with two distinct fills, a brown silty sand deposit (**50003**) located around the edges of the base, and a greyish brown silty clay (**50005**) which sealed this deposit. This ditch appeared to peter out towards the stream which marked the field boundary in this area. However ditch **51002**, located within the next field (Field 51), is on the same alignment and also peters out towards the stream, as well as to the northeast, and it is likely that these are the same ditch, but that the area around the stream has been more heavily truncated. As both these ditches run towards the stream, it is likely that they represent drainage ditches to allow water to run off into the stream. No other features, except for a post-medieval stone field drain (**51003**) were uncovered within Field 51.

Within Field 55, a shallow linear ditch (**55001**) aligned northwest-southeast was uncovered. It measured 1.4m in width, with a depth of 0.18m, and was filled with a single brown silty sand deposit (**55000**). The function of this ditch is uncertain, however it is likely that it represents the remains of a field boundary.

7.7 Field Boundaries

A total of 63 field boundaries were recorded on the site. These took a number of different forms, the most common of which were either a stone wall (**16**-**9**, **21**, **26**-**8**, **32**-**3**, **36**, **52**, **56**-**62**, and **64**-**5**) or a fence (**5**, **9**, **11**-**4**, **25**, **34**, and **42**), but also included banks (**29**, **37**, **39**, and **49**), hedgebanks, and ditches (**40**), or a combination of these (**2**-**4**, **6**-**8**, **10**, **15**, **20**, **22**-**4**, **31**, **35**, **38**, **41**, **43**-**8**, **50**-**1**, **53**-**5**, and **63**). The majority of these boundaries were partially removed within the working corridor area of the pipeline, and were replaced or rebuilt at the end of the job. The exception to this was field boundaries **02**, **03**, **06**, and **16**, which were left untouched. Full descriptions of all the field boundaries can be seen in Appendix IV.

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, and then assessed by Mhairi Hastie of CFA Archaeology Ltd (Appendix V). A total of 26 samples were submitted for assessment.

The plant macrofossil material was generally in a poor condition and much abraded. The bulk of the carbonised plant remains were recovered from the features uncovered within Field 1, with wheat (hulled, emmer/ spelt) being the most common species identified, along with smaller amounts of barley and occasional grains of oat. Neither the barley nor the oat grains were sufficiently well-preserved to allow identification to species level. This assemblage, dominated by hulled wheat and barley, would be consistent with a prehistoric date, and their presence, albeit in small amounts would also suggest that some food processing was being carried out on site.

Weed seeds were recovered from the samples taken from ditch **01001** and postholes **01017** and **01040**. They included seeds of knotgrass, ribwort/ plantain, and gramineae indet (grasses), which are characteristic of waste places and grassland. The seeds could have been either growing on or near to the site, or brought to the site along with the cereal grains.

Fragments of burnt peat were also recovered from the fill of ditch **01001**. The recovery of burnt peat along with a small assemblage of cereal grain from the same feature, suggests that the carbonised plant remains are accumulated remnants of a domestic hearth. A further concentration of burnt peat was recovered from the fill of ditch **42001**. The peat was recovered along with a small amount of heather charcoal, suggesting that the material is the remnants of peaty turfs. The origin of this material is unknown, although it may be an accumulation of domestic debris that has been spread on the fields.

Charcoal was present in a number of samples, with large concentrations recovered from pits **01069** and **01103**, and ditch **01001** in Field 1; three pits in Field 9 (**09005**, **09019**, and **09023**); pits **27002** and **27003** in Field 27; pit **39019** and burnt layer **39015** within Field 39; as well as from possible posthole **42006** in Field 42. The charcoal consisted of a mixture of blocky fragments of oak (from pits **01069** and **01103**, as well as from features within Field 9), a mixture of small round wood fragments of oak and non-oak species (from ditch **01001** and features within Field

39), and fragmentary pieces below the level of identification (from features within Fields 27 and 42).

Hazelnut shell was also uncovered from the fills of pits **01053**, **01013**, **09005**, **09019**, **27002**, **39019**, and posthole **42006**. The small amount, and fragmentary nature of the hazelnut shell, along with the lack of cereal grains within these features, suggests that the hazelnuts were collected along with the fire wood rather than harvested. Full identification of the wood species will allow for this to be determined.

8.2 Auger Survey and Coring

The cores from the auger survey were assessed by James Rackham of the Environmental Archaeology Consultancy (Appendix V). Each 110mm core tube was cut open to expose the core within. This was cleaned, described and logged and photographed. For the cores recovered using the Russian auger, these also were cleaned, described and logged and photographed. A radiocarbon sample was taken from suitable material near the base of each of the eight organic sequences sampled in the earth pipes. These were above the base of the sequence where the Russian corer was used.

The radiocarbon samples were submitted to the Radiocarbon Laboratory at the Scottish Universities Environmental Research Centre (SUERC) for dating.

Samples for pollen analysis were taken at 4cm intervals through each core, bagged, labelled and stored in a fridge. The cores were subsequently wrapped in cling film to seal them.

8.2.1 Radiocarbon Results and Probable Date Range

The series of radiocarbon dates obtained indicate that the sampled deposits include a broad range of dates during prehistory from the early Mesolithic through to the Middle Iron Age.

Collectively the eight sampled sequences are likely to span much of the prehistoric period from the early Mesolithic through to the later Iron Age. Since these cores recovered peats right up to the modern ground surface it is probable that significant parts of the historic period will also be represented in the upper parts of the cores. A black humified horizon is present in the upper part of four cores which is likely to equate to a period of desiccation and drying out of the bogs. Such a drier episode occurred in the Roman period and further radiocarbon dating would establish the date of these horizons and whether they are contemporary. It is clear that the upper part of all cores must include parts of the historic period, but the final span can only be established through further radiocarbon dating.

8.2.2 Results

The spike and auger survey identified a shallow covering of peats over a palaeosol across several areas of the pipeline route but only in eleven areas was this deemed to be worth augering, and of these eleven areas only eight were subsequently core sampled. A palaeosol was recognised beneath the peats in several of the auger transects, but was most likely present beneath the peats in the other transects, although not visually recognised in the field. Peat depth varied along the route from just a few centimetres to 1.65m.

The bulk of the augered areas were peat deposits overlying the natural diamicton (boulder clay/ till), although one location specifically tackled the floodplain of the Afon Dwyfor and a possible palaeochannel that was suggested by a wetter area with rushes on the southern floodplain of the river. This latter area produced mainly mineral sediments and the hand augering was stopped repeatedly by stones in the sediments. No significant organic deposits were located in the six auger holes along this transect so the floodplain was not cored.

The basic superficial deposit sequence along the route comprises an underlying diamicton (glacial till) of Devensian age with an *in situ* developed soil. In places the palaeosol may have suffered erosion and been truncated. Peats, silty peats and organic silts subsequently developed or were deposited over the sampled areas at different periods. The formation of the peats were not synchronous along the whole route.

8.3 Stone

Eight flint flakes recovered from the topsoil or subsoil from across the site were assessed by George Smith (Appendix VII). None of the flakes came from any features. All of the flints, where identifiable, were made from pebble flint which could be sourced locally. There was an absence of imported material or of larger flakes, or finer techniques, which are typical of Late Neolithic activity. None of the flakes were Mesolithic in character, and the majority could belong to Early Neolithic activity. The exception to this is SF #09 (from the topsoil within Field 51), which may be of a 2nd millennium date, although not of an accepted diagnostic type.

8.4 Other Finds

A small number of finds were recovered during the processing of the samples. These included fragments of modern pottery and glass from the fill of pit **01053**, a flake of burnt flint and fragments of burnt bone from the fills of ditch **01001**. The glass and pottery fragments may be later intrusions into the fill of the pit **01053**, most likely by ploughing or animal disturbance. The burnt bone from ditch **01001** is likely to be animal bone, and is consistent with the suggestion that food processing was being carried out in this area. The burnt flint flake will have to be examined to determine its typology and possible date.

9 INTERPRETATION

9.1 FIELD 1

The curvilinear ditch (**01001**) uncovered within Field 1 most likely represents an enclosure ditch which may have enclosed a small settlement. Its location, on fairly high, flat ground, within close proximity to a river would make an ideal location for a settlement. The four postholes (**01017**, **01032**, **01040**, and **01042**) enclosed by this ditch may form part of a structure(s). However, given their close proximity to the edge of the excavation area the type of structure, if any, is unknown. These postholes, along with the presence of a high concentration of cereal grain within both the postholes and the ditch, would also point towards settlement activity in this area.

Unfortunately, the majority of the ditch and whatever features, if any, it enclosed were located outside of the excavation area. Therefore a complete picture of this area cannot be completed. Given the presence of probable prehistoric activity, in the form of the remains of probable round barrows, domestic pits, and possible granary structures, directly to the east of Field 1, it is possible that these sites are contemporary.

9.2 FIELD 9

The remains of a stone wall (**09032**) and a cobbled road (**09026**) uncovered within Field 9 have been dated to the post-medieval period due to the presence of post-medieval pottery and iron horseshoes within each of them respectively. Both the cobbled road and the stone wall run roughly parallel with the main A487(T) road, although the wall appears to turn towards it at one end, while the cobbled road appears to curve slightly away from it at both ends. Directly to the northwest of these features, a local trackway runs from the A487(T) to the WSW and past the remnants of the Beudy Cil Haul manganese mine (PRN 21533) which dates to the post-medieval period. Given the close proximity of this mine then it is likely that the cobbled road and the stone wall are contemporary and related to the activity carried out here.

A large amount of other post-medieval activity was also noted within Field 9, the majority of it consisting of modern pits, furrows, drainage, and a field boundary ditch. Due to this large amount of post-medieval activity and the lack of any other dating evidence, it is likely that the remaining undated features are also result of the activity dating to this period, and are most likely also associated with either field clearance, or activity associated with the mine.

9.3 FIELD 39

The stone platform (**39001**) uncovered at the northwestern end of Field 39 was located adjacent to a stream and within/ on the edge of a marshy area. It is therefore

likely that it was constructed so as to create a solid and dry platform within this area, possibly to aid crossing of the area or for storage. No dating was recovered from this feature and its date is uncertain, although it may be associated with the post-medieval houses located nearby.

The stone concentration (**39027**) partially revealed within Field 39 was located at the bottom of a slope and close to the convergence of two stone drains (**39004** and **39021**). This area is therefore likely to have become regularly waterlogged, and it is probable that the stones were deliberately dumped here most likely to produce a more stable/ drier area. Given that the drains are of a post-medieval date, then it is likely that this stone concentration also dates to this period.

The function and date of pits **39017** and **39019**, along with the burnt spread (**39015**) which sealed them, is currently unknown. The burnt spread contained a high concentration of burnt stone, and it is possible that this represents the remnants of a ploughed out burnt mound, with the pits representing either troughs or hearths. No lining was revealed within either of the pits, although the clayey nature of the natural geology within this area would have allowed water to be retained within both the pits to a certain extent. No evidence of in-situ burning was visible within either pit, which would suggest that neither of these pits represents hearths.

Burnt mounds are commonly found close to a water course, as is the case here, with a river running approximately north-south, directly uphill to the east of **39015**. They most commonly date from the Bronze Age, although earlier and later examples are known. What function a burnt mound serves is still uncertain, with ideas ranging from a sauna, to use in salt production, fulling, or cooking. Although the lack of animal bone recovered from the majority of these features would suggest that cooking is not the primary function of a burnt mound.

9.4 REST OF SITE

The remains of a wall (**50001**) were uncovered at the southwestern end of Field 50. Given the random nature of the coursing it is unlikely that the wall would have had any significant height above grove ground level. This lack of height and its location adjacent and roughly parallel to a stream, would suggest that it was constructed as a revetment wall for this stream, and is therefore most likely post-medieval in date.

The ditches uncovered throughout the site all relate to either current or relict field boundaries, or form part of a drainage system within the fields. The majority of isolated features were, upon excavation, seen to be off a natural nature with the remaining features being mostly of a post-medieval nature. The isolated nature of these features suggests only small scale, one off activity in these areas.

10 STATEMENT OF POTENTIAL

10.1 FEATURES

The enclosure ditch and associated postholes and pits uncovered within Field 1, along with the high concentration of cereal grain recovered from these features, indicate that there was a settlement in this area. Dating of these features is essential so as to determine if they are contemporary with the features uncovered directly to the west within the Dolbenmaen WTW (McNicol 2015), as well as to allow them to be placed within their proper setting. The presence of these features is of national importance in understanding the landscape in this area, and the dating of them will allow for comparison with similar sites, so that a better understanding of the settlement activity can be gained.

The cobbled road, wall, and associated features uncovered within Field 9 are likely to relate to either the post-medieval manganese mine at Beudy Cil Haul (PRN 21533) or the nearby farms. They are therefore only of minor importance in understanding the landscape of the area during the post-medieval period.

The possible burnt mound and associated pits uncovered within Field 39 may date to the Bronze Age, and dating of these features is essential to determine if they are associated with a burnt mound or if they are of a later date. 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.

10.2 ARTEFACTS

Pottery

All the pottery recovered from site dates to the post-medieval period. They therefore have a very low archaeological potential.

Glass

All the glass fragments recovered from site dates to the post-medieval period. They therefore have a very low archaeological potential.

Iron Objects

Three horseshoes were recovered from beneath the cobbled road **09026**. These are most likely of a post-medieval date, and therefore have a very low archaeological potential.

Stone Objects

The eight stone flint flakes were widely dispersed across the site, and were all uncovered from either the topsoil or subsoil. They will be photographed, but no other

work is proposed for them. The small burnt flint flake uncovered during the processing of the samples will be assessed by George Smith.

10.3 Environmental Data

Charcoal and other charred plant remains

The charred plant remains suggest that food processing was being carried out within Field 1, and that domestic hearths were present in the area. The lack of cereal grain from any of the other features from which charcoal was recovered suggests a different use for these features. Identification of the wood species the charcoal derived from will be needed. This will allow for the significance of the charcoal to be considered in the interpretation of the features it came from.

Given the small amount of cereal grain and other plant remains recovered from across the site, no further work is recommended on the plant assemblage.

10.4 Auger Survey and Coring

Collectively the peats and sediments within the series of cores taken on site are likely to cover a large portion of the postglacial history of this part of North Wales. There have been many pollen studies across North Wales, however the bulk of these have been undertaken on upland peat bogs, mires, and moorland areas (Rhind and Jones 2003), with relatively little agricultural activity other than grazing and, of course, early forest clearance.

The value of this series of cores is that they all lie between 97m and 139m OD, in what is quite clearly an agricultural landscape consisting of pastures, hayfields, and even some arable land. The small and localised scale of the sampled bogs means that they are likely to reflect the localised landscape and vegetational history with a bit more clarity than some of the large upland raised bogs.

A considerable number of aspects of the landscape history might be addressed by further study of the cores. For example; evidence for early Mesolithic activity in the area based upon evidence for small scale woodland clearance and microscopic charcoal; the start of early forest clearance in the landscape; the beginnings of arable activity; periods of pastoral expansion; changes and developments in land use; the impact of climate change; the date of episodes of drying out and possible agricultural expansion; arrival of crops like cannabis and rye; and early post-medieval plantations. Their study would give a landscape context for the known archaeology of the area and for those archaeological discoveries made during the course of the archaeological work along the pipeline during its construction.

With three sites near the floodplain of the Afon Dwyfor, four more on the plateau lands above the Afon Henwy, and one a little further up the valley towards the edge of the foothills of Snowdonia, there is also the possibility of discerning any localised

patterns of land use that might occur as the sites move upstream into slightly more marginal areas for agriculture.

10.4.1 Recommendations

The primary objective of this programme of auger survey and core sampling was to recover deposit sequences, primarily peats that would allow a reconstruction of the vegetational history of the valley through the analysis of pollen and radiocarbon dating. Where the cores were recovered in the 110mm diameter earth pipe there is potential for the analysis of the plant and insect macrofossils. Loss on ignition studies of the organic deposits should also be undertaken to more closely define the deposit character and establish the mineral input.

The preliminary dating of the cores has established that the sampled sequences represent much of the post-glacial period and that all of the cores could contribute to the original objectives of the project. The following analyses are therefore recommended to establish a vegetational history for the local area, establish the impact of man on this vegetation, and give a palaeoenvironmental context for the local archaeology.

The whole sequence in four of the cores should be studied for pollen, and additionally all samples below 20cm in a further three cores. Selected 10cm core units from four of these cores should be processed and studied for macrofossil remains. The base of the sequences in three of these cores should be radiocarbon dated and samples from the upper part of each core sequence studied should be dated on the basis of the pollen results to give a chronology for the vegetational changes recognised that can then be tied into to the local archaeological evidence. Dating of the top of selected black humified horizons and the less humified peats immediately above will establish the possible existence and duration of any hiatus in the sequences which might reflect a drier period during which agricultural expansion could occur.

These analyses can then be used to establish the local and regional vegetational and landscape history of the area, and the human impact on it, and correlate this with the known archaeology and that which was uncovered during this fieldwork.

10.5 DATING

The only roughly datable finds recovered from the site were the flint flakes recovered from the topsoil and subsoil, along with the post-medieval pottery, glass, and iron horseshoes. Dating is therefore a high priority, particularly of the features within Field 1, as these may be of a prehistoric date, given their close proximity to probable prehistoric features uncovered to the east (McNicol 2015).

Due to the scarcity of any datable finds from the site, the dating must therefore rely on radiocarbon dates produced from the charcoal, cereal grain, and hazelnut shell recovered from the samples. Identification of the wood species would need to be

carried out prior to the submission for dating. 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 basal fill (**01066**) of enclosure ditch **01001**, as well as from postholes **01017** and **01042**, and pit **01040** within the same area. Further dates should be obtained from the burnt spread **39015** and underlying pit **39019**.

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 12 dates are proposed on six 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.

10.6 RECOMMENDATIONS

The site narrative will need expanding and the site needs to be discussed in its wider landscape context. The site narrative will also be combined with that from the Dolbenmaen WTW. The following tasks are recommended:

- Full appropriate drawings and photographs to accompany the narratives are necessary.
- No further study of the flint flakes is recommended, with the exception of the single burnt flake uncovered during the processing of the samples, which will be assessed by George Smith. All the flakes will be recorded photographically.
- The post-medieval glass, pottery, and horseshoes will be discarded.
- Further analysis of the charcoal will be carried out by CFA Archaeology so as to fully identify and tabulate the charcoal remains, as well as to ascertain any specific spatial distribution.
- The charcoal, cereal grains, and hazelnut shells will be assessed by CFA Archaeology to determine their suitability for dating and a selection sent to SUREC for dating. A total of 12 dates from six features is proposed. The selection details will be included in the updated project design.

- Pollen analysis will be carried out on 175 samples from seven of the auger cores, along with macrofossil analysis and loss on ignition analysis on selected samples. A maximum of 14 radiocarbon dates will also be obtained from a selected number of cores. This will allow for a vegetational history of the local area to be produced, and allow for the impact of man on this vegetation to be established, as well as providing a palaeoenvironmental context for the local archaeology.

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. This project design will combine the work undertaken on this site as well as that undertaken on the Dolbenmaen WTW in 2013/ 2014. The updated project design will be submitted along with this report.

11 ACKNOWLEDGEMENTS

The author would like to thank Black & Veatch Limited for commissioning the work, and all the staff at Dawnus for their invaluable help on site. The work on site was carried out by Dave McNicol, Iwan Parry, Neil McGuiness, Anne Marie Oates, Ken Owen, Robert Barnett, Margaret Feryok, Michael Tunnicliffe, Gemma Jones, and Peter Aherne.

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APPENDIX I: PROJECT DESIGN

APPENDIX II: WRITTEN SCHEME OF INVESTIGATION

APPENDIX III: CONTEXT REGISTER

APPENDIX IV: FIELD BOUNDARIES

APPENDIX V: PALEOENVIRONMENTAL REPORT

APPENDIX VI: AUGER SURVEY AND CORING REPORT

APPENDIX VII: LITHIC REPORT

APPENDIX I: PROJECT DESIGN

DOLBENMAEN WTW TO CWMYSTRADLLYN WTW TRANSFER PIPELINE

PROJECT DESIGN FOR

ARCHAEOLOGICAL EVALUATION:

Archaeological Trial Trenching (G2231)

Prepared for

BLACK & VEATCH LTD

February 2013

Ymddiriedolaeth Archaeolegol Gwynedd

Gwynedd Archaeological Trust

DOLBENMAEN WTW TO CWMYSTRADLLYN WTW TRANSFER PIPELINE

PROJECT DESIGN FOR ARCHAEOLOGICAL EVALUATION:

Archaeological Trial Trenching (G2231)

Prepared for *Black & Veatch Ltd*, February 2014

1.0 INTRODUCTION

Gwynedd Archaeological Trust (GAT) has been asked by *Black & Veatch Ltd* to provide a project design for carrying out a programme of archaeological trial trenching in response to the results of a geophysical survey (Stratascan forthcoming) and analysis of airborne Lidar (Light detection and ranging) data within the working corridor along the route of the transfer pipeline between Dolbenmaen Water Treatment Works (WTW) (NGR SH 4986 4926) and Cwmystradllyn Water Treatment Works (WTW) (NGR SH 5471 4286) *see Figure 1*.

As stated para. 3.1.2 of the Written Scheme of Investigation (WSI) (December 2013):

Based on the results of the geophysical survey, specific anomalies may be targeted for additional information on archaeological content and context. This will be undertaken using targeted trenching. The extent and location of the targeted areas will be defined in a further archaeological works design (FAWD) that will be approved by SNPA and GAPS.

It is therefore proposed that a total of 18 trenches are excavated to investigate anomalies which appear to be archaeological in origin and may cause disruption to the project timetable if not investigated prior to the controlled strip.

A detailed brief has not been prepared for this stage by Gwynedd Archaeological Planning Service (GAPS) or the Snowdonia National Park Authority (SNPA): However GAPS and SNPA have verbally confirmed, following scrutiny of the provisional geophysical results and Lidar data, that a series of archaeological trial trenches should be excavated to assess identified features.

The current design conforms to the guidelines specified in the *IFA Standard and Guidance for Archaeological Evaluation* (Institute for Archaeologists, 1994, rev. 2001 & 2008).

The content of this design and all subsequent designs and reports must be approved by both GAPS and SNPA.

2.0 BACKGROUND

2.1 SCHEME BACKGROUND

The transfer pipeline route is located between Dolbenmaen water treatment works (**NGR SH49864926**) and Cwmystradllyn water treatment works (**NGR SH54714286**), as indicated on *Black and Veatch* Drawing No. 174357-20-9100 (reproduced as Figure 1). The route measures *c*.5km in length and the proposed easement will be 21.8m in width, the easement route will be surrounded by a stockproof fence.

The scheme route starts at the Dolbenmaen water treatment works (WTW) and runs eastwards for 300.0m across an open field before turning south for 80m crossing Afon Dwyfor and then running southwestwards for 560.0m to then run parallel to the south side of the A487(T) road for 190.0m to then cross the A487(T) road, following the route of a local road for 550.0m and then crossing a series of irregular fields to the east for a distance of 720.0m and then southeast for 780.0m, before continuing northeast for 1.87km to terminate at the Cwmystradllyn WTW (Figure 1).

Based on current information the easement route will be separated into an intrusive zone and a non-intrusive zone: intrusive works are limited to a 13.8m wide portion of the easement, which will be segregated from the non-intrusive zone by an internal fence. The intrusive works zone will be stripped of topsoil to a mean depth of 100mm and the material stockpiled in the non-intrusive zone; a 5.0m wide haul road built from geotextile membrane and crushed stone will then be laid within the intrusive zone. This haul road will be used to transport pipe along the route, which will then be stockpiled prior to burial in the non-intrusive zone. The 4.8m wide pipe trench for the treated water and raw water mains will then be excavated in the intrusive zone parallel to the haul road and the excavated material stockpiled alongside. On completion, the pipe trench will be buried, the haul road removed and the topsoil reinstated.

In addition to the transfer main, there will also be the following programmed works:

- a 50mm branch pipeline that will run from Dolbenmaen WTW to Dolbenmaen village that crosses the A487(T) c.500m from the scheme start point and then continues along the local road into Dolbenmaen village, where it terminates (as detailed on *Black and Veatch* Drawing Nos. **174357-20-0404 Rev C** and **174357-20-0405 Rev C**).
- 5No pipeline cross connections that will connect the transfer main to existing smaller diameter branch pipes, replacing the existing set up for the 18” main. These cross connections will be of small diameter (50 to 200 mm) and of short length, as indicated on *Black and Veatch* Drawing Nos. **174357-20-9100 Rev B**.
- Reconnections to all properties or cattle troughs that are currently supplied directly off the treated water main. The locations and quantities of these are not recorded by Dŵr Cymru but it is expected that these will be very small diameter connections and the works will be normally carried out within the notified construction easements.

Three temporary compounds will also be constructed along the route as shown in Figure 1.

2.2 Archaeological Background

GAT completed an archaeological assessment report in advance of the proposed works (Smith 2013) which summarised that the route lies within a varied archaeological landscape and passes close to a number of sites of known archaeological significance dating from the prehistoric to the post-medieval.

The sites identified within the landscape include a number of hut circles/ structures dating from the prehistoric to the Romano-British period (PRN 145, 150, 160, 164, 165, 166, 170, 172, 188, and NPRN 145), two probable Bronze Age standing stones (Beudy Cil-Haul (PRN 192) and Meini Hirion (PRN 2359 and 2360)), and a burnt mound (Glan-Dwyfach (PRN 154)). Recent discoveries during the archaeological mitigation for the Dolbenmaen WTW have confirmed the existence of prehistoric ritual activity at this location (GAT forthcoming).

The current A487 (T) may follow the line of the Segontium – Pen Llystyn – Tomen y Mur Roman Road (PRN 17553) as a route connecting Segontium with the fort at Pen Llystyn and a bathhouse at Tremadog.

The westernmost part of the proposed route lies within the medieval centre of Dolbenmaen in the commote of Eifionydd, and formed part of the medieval township of Dolbenmaen (PRN 7341). The current village core is to the east of the WTW and the proposed route passes a number of significant archaeological remains from the medieval period including the Scheduled Ancient Monument of Dolbenmaen motte (PRN 161 (SAM CN063)). The motte is located to the south of Dolbenmaen, directly to the north of the working corridor. The castle mound and ditch stand on a low ridge running parallel to the river Dwyfor at a fordable crossing point on an important route way. The motte's early history is unclear and it may either be Welsh or Norman built.

2.2.1 Geophysical Magnetometer Survey

GAT subcontracted Stratascan Ltd. to conduct a standard resolution magnetometer survey of all accessible portions of the easement route and compound areas in advance of groundworks. The survey corridor was 30m wide and centred on the centreline of the easement, extending approximately 5m beyond the edges of the affected corridor.

Both the client and curators have assessed the provisional results of the survey (Prestidge 2013).

The main areas of probable archaeological activity are:

- At the western end of the pipe route in the vicinity of the motte at Dolbenmaen between SH5011043100 and SH5083042860 numerous anomalies were identified including linears and a possible enclosure (Figure 2).

- At SH5334042170 north of the junction for Cwmystradllyn a fairly large anomaly which appears to contain a number of right angles seems to be archaeological in origin (Figure 5).
- At SH5429042690 a possible sub-rectangular enclosure was identified (Figure 6).

A number of other more ephemeral anomalies which may be archaeological have also been identified and will be targeted by the trenches. The archaeological trial trenches proposed in this design will assess the results of the survey on the ground.

2.2.2 Airborne Lidar Data

Inspection of the 1m resolution Lidar data revealed a number of archaeological features, some of which corresponded to anomalies seen on the geophysical survey results. The majority of these were linear features, likely to be field boundaries and drainage some of which were present on the Ordnance Survey 1st edition 25" map of 1889. Ridge and furrow plough marks, associated with medieval ploughing, were also identified in a number of fields along the route.

2.3 TOPOGRAPHY

The western part of the pipeline route roughly follows the course of the Afon Dwyfor and the A487(T) in a general southeasterly direction with the road standing at approximately 95m above OD adjacent to the WTW. The surrounding fields are characteristically floodplain pasture land, generally clawdd enclosed. This terrain continues largely unaltered, with only minor changes in the quality of pasture, until the route turns to the east at the junction of the A487 towards Golan. This part of the pipeline route follows the Afon Henwy and is boggy in character with no good pasture; this area however, is still enclosed with cloddiau. To the south of the road the ground improves, once again becoming enclosed pasture, although showing signs of being poorly drained and waterlogged in places. This mixed landscape of pasture and wet ground continues until the pipeline route reaches the hamlet of Ynys Pandy and turns ENE. Beyond Ynys Pandy the pipeline route begins to climb and becomes enclosed upland pasture. The location of the proposed Cwmystradllyn WTW sits at approximately 195m above OD.

The floodplain of the Afon Dwyfor, to the west of the pipeline route, cuts through an area of primarily Ordovician rocks (Bassett & Davies 1977). To the east, the underlying geology consists of basalt, dolerite, and diabase (British Geological Survey). There are likely to be other isolated deposits with the potential for peaty deposits within the more waterlogged areas and alluvial river terraces.

3.0 METHOD STATEMENT

The archaeological trial trenching will target anomalies identified in the magnetometer survey and features seen on the Lidar data. All of the trenches will be located within the working areas of the scheme and will vary in shape and dimensions (tailored to the targeted features). 17 trenches will be within the confines of the main easement, one trench will be located on a spur to connect properties at the junction for Cwmystradllyn (SH53354204). It is possible that trenches will need to be extended, or additional trenches excavated, to further assess and interpret identified features.

3.1 Proposed Archaeological Trial Trenches

18 trial trenches are proposed to target features along the length of the scheme. These are:

ET01 2m x 15m, SH5012643100 (Figure 2)

Located to investigate a linear feature running east-west identified on both the geophysical survey results and Lidar data and a curving feature identified on the geophysical survey. It is suggested by Stratascan in their preliminary report that the features are both positive, suggesting that they are cut features e.g. ditches rather than built walls or banks. The trench intersects both features where they are in closest proximity to each other where a physical relationship is most likely.

ET02 5m x 5m, SH5014843100 (Figure 2)

Located to investigate the same east-west orientated linear as ET01 at a point where it appears to be intersected by another short linear running north east-south west. Excavation should provide a relationship between both features.

ET03 2m x 10m, SH5027343076 (Figure 2)

Located to investigate a linear running north east-south west identified on both the geophysical survey and Lidar data.

ET04 2m x 15m, SH5040243041 (Figure 2)

Located to investigate two roughly parallel linear features running roughly east-west which may be a bank and ditch.

ET05 8m x 8m, SH5043243022 (Figure 2)

Located to investigate a cut feature which may form part of a sub-rectangular enclosure. The trench has been positioned to investigate the perimeter and what appears to be a break in the feature, possibly indicating an entrance with associated pit or post hole.

ET06 2m x 20m, SH5045843018 (Figure 2)

Located to generally assess area surrounding potential archaeological features.

ET07 2m x 10m, SH5048143007 (Figure 2)

Located to investigate a possible sub-circular feature identified on the geophysical survey.

ET08 2m x 20m, SH5053842981 (Figure 2)

Located to investigate a north-south running linear identified on the Lidar data which corresponds to a field boundary shown on the Ordnance Survey 1st edition 25" map of 1889 and anomalies shown on the geophysical survey.

ET09 2m x 20m, SH5059942958 (Figure 2)

Located to investigate a large curving feature, which may be natural, identified on both the Lidar data and geophysical survey and will also assess the location of a field boundary, which roughly respects the curve of the main feature, shown on the Ordnance Survey 1st edition 25" map of 1889.

ET10 2m x 20m, SH5079342875 (Figure 3)

Located to investigate a fairly large sub-rectangular feature identified on the geophysical survey.

ET11 'T' shaped 4m x 15m, SH5103642724 (Figure 3)

Located to investigate what appear to be two parallel linears running roughly north-south and a possible spur heading east, which can be seen on the geophysical survey.

ET12 2m x 20m, SH5273842366 (Figure 4)

Located to assess an area of amorphous magnetic variation which may be archaeological in origin.

ET13 2m x 20m, SH5332842114 (Figure 5)

Located on a spur from the main easement in an area of possible archaeological activity, close to a large magnetic anomaly which appears to be archaeological.

ET14 8m x 8m, SH5336342181 (Figure 5)

Located to investigate a large magnetic anomaly identified on the geophysical survey which appears to have a number of right angled corners and is suspected to be archaeological in origin.

ET15 4m x 10m, SH5428842686 (Figure 6)

Located to investigate a possible sub-rectangular feature, roughly orientated north east-south west, identified on the geophysical survey. The trench is positioned to investigate the south-western end of the feature including a corner and possible break in the perimeter.

ET16 2m x 10m, SH5428842703 (Figure 6)

Located to investigate the same feature as ET15, targeting the north-western side.

ET17 2m x 20m, SH5468942929 (Figure 6)

Located to investigate possible sub-circular features identified on the geophysical survey. One well defined example appears to be beyond the limits of the easement, ET17 and ET18 will target possible anomalies of similar appearance.

ET18 2m x 20m, SH5469742919 (Figure 6)

Will be excavated with ET17 to investigate possible sub-circular features.

3.2 Specific Methodology

- All trenches will be excavated using plant supplied by client using a toothless, flat, ditching bucket under constant direction by an archaeologist.
- Trenches will be accurately located and marked out with a Trimble R6 GPS system.
- The trenches will be excavated until archaeological deposits are identified or the underlying natural deposits are encountered, where deep alluvial or colluvial deposits are encountered the trench will not be excavated beyond the proposed depth of the pipe trench.
- All identified features within the trenches will be cleaned by hand and partially excavated to attempt to determine date and function.
- With the exception of post-medieval features, at least 50% of all pits and post holes and 10% of each linear feature will be excavated.
- Where appropriate deposits are encountered, bulk soil samples will be collected for environmental analysis, macroscopic artefact recovery and potential radiocarbon dating.
- All trenches and identified features will be recorded in writing, measured drawings and digital photographs (RAW format). Digital surveys using a Trimble R6 GPS system may also be required.
- If trenches containing archaeology need to be temporarily back-filled, upon specific approval by curators, a geotextile will be laid at the base prior to backfilling.
- Client, GAPS and SNPA will be given opportunities to inspect trenches before backfilling. If trenches are to remain open overnight they will be cordoned off with orange mesh fencing and road pins, particularly deep excavations may require the erection of heras fencing.

3.3 Evaluation Aims

The evaluation will aim to address the following:

- Verify the efficacy of the geophysical survey for identifying archaeological remains within the site
- 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
- Assess the level of risk any surviving remains may pose to the progression of the development.

NB. If significant archaeological activity is identified within any trench during the trial trenching submission of a Further Archaeological Works Design (FAWD) may be required, as outlined in the WSI (Para. 3.4), see Para. 4.0 below for FAWD procedure.

3.4 Report

Following completion of the stages outlined above, a brief report will be produced incorporating all results and will include:

1. Introduction
2. Project Design
3. Methods and techniques
4. Archaeological Background
5. Results of the Archaeological Trial Trenching
6. Summary and conclusions and further recommendations.
7. List of sources consulted.

All information will also be incorporated into the final fieldwork report which will be produced following the completion of all work on site.

4.0 FURTHER ARCHAEOLOGICAL WORKS

The identification of significant archaeological features during the evaluation stage may necessitate further archaeological works.

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. The requirement for a FAWD will be determined in consultation and liaison with GAPS and SNPA including through 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.

The FAWD document will need to be approved by GAPS and/or SNPA depending on the area in which the work is located.

5.0 ENVIRONMENTAL SAMPLES

If necessary, relevant archaeological deposits will be sampled by taking bulk soil samples (maximum of 30.0 litres) for flotation of charred plant remains and macroscopic artefact recovery. Bulk samples may also be taken from waterlogged deposits for the recovery of macroscopic plant remains, and deposits such as middens may be sampled to recover small animal bones and artefacts.

6.0 HUMAN REMAINS

Any finds of human remains will be left *in-situ*, covered and protected, and the coroner, GAPS and SNPA 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.

7.0 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, ARCUS at Sheffield and BAE at Birmingham.

7.1 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.

8.0 STAFF & TIMETABLE

8.1 STAFF

The project will be supervised by John Roberts, Principal Archaeologist at GAT: Contracts. The work will be carried out by fully trained Project Archaeologists who are experienced in conducting project work and working with contractors and earth moving machinery. (Full CV's are available upon request).

8.2 TIMETABLE

Providing the current design is accepted by client, GAPS and SNPA trial trenching will begin on 17/02/2014 and is estimated to be completed in 10 working days. Provisional results will be reported within 1 month of the end of the trial trenching programme.

9.0 HEALTH AND SAFETY

The Trust subscribes to the SCAUM (Standing Conference of Archaeological Unit Managers) Health and Safety Policy as defined in **Health and Safety in Field Archaeology** (2007).

10.0 INSURANCE

Liability Insurance - Aviva Policy 24765101CHC/00045

- Employers' Liability: Limit of Indemnity £10m in any one occurrence
- Public Liability: Limit of Indemnity £5m in any one occurrence
- Hire-in Plant Insurance: £50,000.00 any one item;

£250,000.00 any one claim

The current period expires 22/06/14

Professional Indemnity Insurance – RSA Insurance Plc P8531NAECE/1028

- Limit of Indemnity £5,000,000 any one claim

The current period expires 22/07/14

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APPENDIX II: WRITTEN SCHEME OF INVESTIGATION

TRANSFER PIPELINE BETWEEN DOLBENMAEN WTW AND CWMYSTRADLLYN WTW

WRITTEN SCHEME OF INVESTIGATION FOR

A STAGED PROGRAMME OF ARCHAEOLOGICAL EVALUATION AND MITIGATION

Prepared for

BLACK & VEATCH LTD

December 2013

Ymddiriedolaeth Archaeolegol Gwynedd

Gwynedd Archaeological Trust

PROPOSED TRANSFER PIPELINE BETWEEN DOLBENMAEN WTW AND CWMYSTRADLLYN WTW

WRITTEN SCHEME OF INVESTIGATION FOR A STAGED PROGRAMME OF ARCHAEOLOGICAL EVALUATION AND MITIGATION

Prepared for *Black & Veatch Ltd*, December 2013

1. INTRODUCTION

Gwynedd Archaeological Trust has been asked by Black & Veatch Ltd to provide a written scheme of investigation (WSI) for a staged programme of Archaeological Evaluation and Mitigation works in advance of and during the Dolbenmaen water treatment works to Cwmystradllyn water treatment works pipeline transfer scheme.

The transfer pipeline route is located between Dolbenmaen water treatment works (**NGR SH49864926**) and Cwmystradllyn water treatment works (**NGR SH54714286**), as indicated on *Black and Veatch* Drawing No. 174357-20-9100 (reproduced as Figure 01). The route measures *c*.5km in length and the proposed easement will be 21.8m in width, as indicated on *Black and Veatch* drawing *Cwmystradllyn to Dolbenmaen – Pipeline Easement Sequence* (reproduced as Figure 06). The easement route will be surrounded by a stockproof fence.

The scheme route starts at the Dolbenmaen water treatment works (WTW) and runs eastwards for 300.0m across an open field before turning south for 80m crossing Afon Dwyfor and then running southwestwards for 560.0m to then run parallel to the south side of the A487(T) road for 190.0m to then cross the A487(T) road, following the route of a local road for 550.0m and then crossing a series of irregular fields to the east for a distance of 720.0m and then southeast for 780.0m, before continuing northeast for 1.87km to terminate at the Cwmystradllyn WTW (*cf.* Figure 01).

Based on current information the easement route will be separated into an intrusive zone and a non-intrusive zone: intrusive works are limited to a 13.8m wide portion of the easement, which will be segregated from the non-intrusive zone by an internal fence. The intrusive works zone will be stripped of topsoil to a mean depth of 100mm and the material stockpiled in the non-intrusive zone; a 5.0m wide haul road built from geotextile membrane and crushed stone will then be laid within the intrusive zone. This haul road will be used to transport pipe along the route, which will then be stockpiled prior to burial in the non-intrusive zone. The 4.8m wide pipe trench for the treated water and raw water mains will then be excavated in the intrusive zone parallel to the haul road and the excavated material stockpiled alongside. On completion, the pipe trench will be buried, the haul road removed and the topsoil reinstated. This staged process is detailed in Figure 06.

The archaeological evaluation and mitigation strategy will be completed as a pre-construction, construction and post-construction programme of works, as summarised in para. 1.1 and detailed in para. 3.0.

In addition to the transfer main, there will also be the following programmed works:

- a 50mm branch pipeline that will run from Dolbenmaen WTW to Dolbenmaen village that crosses the A487(T) c.500m from the scheme start point and then continues along the local road into Dolbenmaen village, where it terminates (as detailed on *Black and Veatch* Drawing Nos. **174357-20-0404 Rev C** and **174357-20-0405 Rev C**).
- 5No pipeline cross connections that will connect the transfer main to existing smaller diameter branch pipes, replacing the existing set up for the 18” main. These cross

connections will be of small diameter (50 to 200 mm) and of short length, as indicated on *Black and Veatch* Drawing Nos. **174357-20-9100 Rev B**.

- Reconnections to all properties or cattle troughs that are currently supplied directly off the treated water main. The locations and quantities of these are not recorded by Dŵr Cymru but it is expected that these will be very small diameter connections and the works will be normally carried out within the notified construction easements.

Black and Veatch Drawing No.**174357-20-9100 Rev B** locates three compounds alongside the route that will be constructed for the scheme:

- Contractor Compound Number 1 – located next to a minor road 1.13km from scheme start point at NGR SH25123425
- Contractor Compound Number 2 - located at NGR SH25123425, 2.40km from scheme point
- Contractor Compound Number 3 - located at NGR SH25393424, 3.18km from scheme start point

<u>These additional works will also be subject to the archaeological evaluation and mitigation strategy.</u>

The route is located partly within the Snowdonia National Park: the initial *c*.3.0km are located outside of the Snowdonia National Park, the final *c*.2.0km are within the Park.

The scheme will be monitored by the Gwynedd Archaeological Planning Services (GAPS) and the Snowdonia National Park Authority (SNPA) Archaeologist. The SNPA has outlined the structure of the required evaluation and mitigation programme in an email and written correspondence further to feedback on the screening opinion and the WSI requirements (SNPA letter dated 20/11/13; email correspondence dated 25/11/13 from SNPA to Dwr Cymru; SNPA letter dated 28/11/13; email correspondence from SNPA to GAT dated 10/12/13).

T*he content of this WSI and all subsequent designs and reports must be approved by both GAPS and SNPA*.

1.1 Transfer Pipeline Archaeological Evaluation and Mitigation Works

The Archaeological Evaluation and Mitigation works will be completed as a staged process and will be undertaken as pre-construction works, construction works and post-construction works:

Pre-construction works:

1. Geophysical survey of the pipeline transfer route easement and compounds;
2. Investigative works targeting the results of the geophysical survey as necessary.
3. A written and photographic record of all field boundaries affected by the scheme. *Note a construction phase record of the boundaries will also be completed to record the exposed boundary profiles*

Note: please cf. para. 3 for additional information on the respective methodologies

Construction works:

Preservation in record:

This will incorporate the archaeological investigation and recording of **all intrusive works** and attendant excavation and recording of all identified features of archaeological interest including, but not necessarily restricted to, the following intrusive works which have been identified to date:.

1. A controlled topsoil strip within the easement route to accommodate all areas subject to intrusive works; based on current information, this is limited to a 13.8m wide portion of the 21.8m easement;
2. A controlled topsoil strip of the Compounds – no deeper excavations are currently proposed for the compounds;
3. A controlled strip of the 4.8m wide transfer pipeline trench.
4. A controlled strip of the directional drilling zone to cross Afon Dwyfor
5. A controlled strip of the 50mm wide Dolbenmaen village branch pipeline, from Dolbenmaen WTW as far as the A487(T) crossing point c.500m to the east; the controlled strip will be completed for the 300mm pipe trench;
6. An archaeological watching brief of the 50mm wide branch pipeline along Dolbenmaen village road; *Note: once the branchline crosses the A487 (see Figure 01), it will follow the local road/road verge in Dolbenmaen and does not cross any fields north of the A487. The branchline in the local road run to the north of the Scheduled Ancient Monument Cn161 (Dolbenmaen Castle Mound), and at the closest point will be 24.0m north of Cn161.*
7. An archaeological watching brief during the crossing of the A487(T) road;
8. An archaeological watching brief for all instances of minor intrusive works, to include:
    a. 5No pipeline cross connections that will connect the transfer main to existing smaller diameter branch pipes, replacing the existing set up for the 18” main.
    b. Reconnections to all properties or cattle troughs that are currently supplied directly off the treated water main.
9. A written and photographic record of all field boundaries affected within the easement corridor.

Note: please cf. para. 3 for additional information on the respective methodologies;

Preservation in situ:

Avoidance of all currently known features of archaeological interest in the vicinity of the scheme, to be ensured by their identification to construction contractors etc. and their fencing or marking-out to prevent ingress of machinery. Similar arrangements will be needed for the reinstatement works to prevent inadvertent damage, both along the easement and within the compounds.

Sampling/Specialist Advice:

1. Palaeoenvironmental sampling (particularly for palynology/pollen analysis and radiocarbon dating, where applicable)
2. Specialist advice and analysis (to be confirmed further to requirements during works)

Post-construction phase:

The management of the post-construction 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 (WSI)
- 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 phase (Phase 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).

1.2 INSTITUTE FOR ARCHAEOLOGISTS STANDARD AND GUIDANCE

This WSI conforms to the relevant Institute for Archaeologists standard and guidance:

- *Standard and Guidance for Archaeological Excavation* (Institute for Archaeologists, 1995, rev. 2001 and 2008).
- *Standard and Guidance for Archaeological Field Evaluation* (Institute for Archaeologists, 1995, rev. 2001 and 2008).
- *Standard and Guidance for Archaeological Geophysical Survey* (Institute for Archaeologists, 2011).
- *Standard and Guidance for Archaeological Watching Brief* (Institute for Archaeologists, 1995, rev. 2001 and 2008).
- *Standard and Guidance for the Creation, Compilation, Transfer and Deposition of Archaeological Archives* (Institute for Archaeologists, 2009).
- *Standard and Guidance for the Collection, Documentation, Conservation and Research of Archaeological Materials* (Institute for Archaeologists, 2008).

2. BACKGROUND

2.1 ARCHAEOLOGICAL BACKGROUND

The easement route lies within a rich archaeological landscape with extensive archaeological evidence from many periods. Numerous archaeological features are known to be situated in the environs of the route, both along its length and within similar topographical situations, including in particular bronze age ceremonial and domestic sites, iron age/roman period settlements and sites and medieval settlements together with an earthen castle and possible site of a royal court (‘Ilys’) of the princes of Gwynedd and its bond settlement (‘maerdref’).

The known archaeological features within or within proximity of the easement is listed in Table 1 and Figures 02 to 05, and a list of sites on the Gwynedd Historic Environment Record database within 500m of the study area is listed Appendix II.

Table 1 – List of archaeological features within or within proximity of the easement

Feature Nos	**Name**	**Impact**	**Archaeological Evaluation**	**Archaeological Mitigation**	**NGR Location**
1	Remains of a building at Pen-y-Cafn	None	None	Avoidance	SH52854229
2	Possible Burnt Mound at Corsoer	None	None	Avoidance	SH51304267
3	Motte at Dolbenmaen SAM Cn063	None	None	Avoidance	SH50654307
4	Dolbenmaen Medieval Township	Likely	None	Controlled Strip	SH50604300 C
5	Pont Dolbenmaen Listed Building Grade II; Ref; 4213	None	None	Avoidance	SH 50754297
6	Slate Quarry, Ysgubor Cerrig, Dolbenmaen	Unlikely	None	Proximity area will be mitigated via the evaluation and mitigation strategy	SH51004270
7	Ynys Pandy Carved Stone	None	None	Avoidance	SH52804230
8	Clwt y Ffolt, Dolbenmaen	None	None	Avoidance	SH53104220
9	Milestone	None	None	Avoidance	SH51614247
10	Stone building west-south-west of Cefn Coed Isaf	None	None	Avoidance	SH53984244
11	Sheepfold	None	None	Avoidance	SH54374275
12	Field Boundaries	Likely	None	Basic Recording	Scheme wide
13	Beudy Tai Duon	None	None	Avoidance	SH50084307
14	Segontium – Pen Llystyn – Tomen y Mur Roman Road	Unknown	None	None	SH48324359 C
15	Segontium – Pen Llystyn – Tomen y Mur Roman	Unknown	None	Watching Brief at A487(T) Road	SH52553973C

	Road			crossing point for the transfer main (1.55km from scheme start point) and the branch pipeline through Dolbenmaen Village	
16	Segontium – Pen Llystyn – Tomen y Mur Roman Road	Unknown	None	Watching Brief at A487(T) Road crossing point (1.55km form scheme start point) for the transfer main and the branch pipeline (500m from scheme start point)	SH59233829C
17	Brynkir Mill Race	None	None	Will be avoided	SH53064215

The location of these features is detailed on Figures 02, 03, 04 and 05.

There is demonstrated potential for the presence of buried archaeological remains with no surface manifestation within the area. Important prehistoric features were found during recent archaeological excavations in advance of extension works for the Dolbenmaen Water Treatment Works. The controlled strip completed by the Gwynedd Archaeological Trust, identified evidence for prehistoric domestic and ritual activity. The latter included three possible ring ditches that were as extant as circular or near circular ditches that measured 8.5m, 9.5m, and 11.5m in diameter (internally) respectively, as well as five cremation pits containing burnt bone, two of which were located centrally within one of the ring ditches, suggesting it could be the remains of a ploughed out round barrow burial site. The post-construction archaeological assessment and analysis stage has not been completed at the time of writing to allow for further information on date, function and interpretation of the features but the recorded information indicates a more extensive prehistoric landscape within this area than was previously understood.

2.2 GEOTECHNICAL INVESTIGATION

Black and Veatch has completed a geotechnical investigation programme along the easement route that was completed by *Ground Investigation (Wales) Limited* between July and October 2012 (document ref.: 174357-20-2718-A, June 2013; reproduced as Appendix III). The programme was completed as two phases of work: Phase 1 comprised 34 trial pits that were excavated along the proposed route; Phase 2 comprised 4 boreholes sunk at strategic positions along the route of the Afon Dwyfor crossing point and 2 boreholes located on the banks of the Afon Ddu.

The geotechnical programme divided the easement route into three sections:

- The eastern third of the pipeline route, which ran from the Cwmystradllyn WTW southwestwards to the local Golan road and included Trial Pits TP11 to TP19, starting with TP11 near the Cwmystradllyn WTW;
- The central third of pipeline route, which ran generally east to west along the easement route where it ran parallel to the local Gloan road and included Trial Pits TP20 to TP31;
- The western third of the pipeline route, which ran generally parallel to the northern side of the A487(T) road to Dolbenmaen village and included Trial Pits TP32 to TP38; and an additional series of Trial Pits (TP43 to TP52), which were located along the current proposed easement route, from the crossing point over the A487(T) and then west Dolbenmaen WTW.

The results of the geotechnical investigation provide valuable information on the depths of the topsoil and succeeding deposits, including alluvia and colluvia, as well as the location of deposits, especially peats, of palaeoenvironmental value. The value of this information will be to provide background data that can be used during the controlled strip programme to assist interpretation of the deposits encountered beneath the topsoil and to assist with strategising the palaeoenvironmental sampling programme.

The geotechnical investigation results suggested that the thickness of the topsoil and subsoil horizons varied along the route (subsoils are classed here as degraded topsoil or former ploughsoils and do not include alluvia and colluvia, which are characterised separately).

The topsoil/subsoil horizon varied at the western end of the route (south of the A487; cf. Figure 02) between 0.19m and 0.38m and between 0.21m and 0.53m at the eastern end of the route. The western portion of the route included the Afon Dwyfor river valley and this was reflected in the identification of alluvia beneath the topsoil/subsoil horizons in several trial pits at the lower portions of the valley. A cemented/oxidised ironstone horizon was identified in two trial pits at this end: TP46 and TP47; this will need to be considered both by the geophysical survey and the controlled stripping teams as the ironstone could impact on the local geophysical survey results and also needs to be identified and interpreted correctly by the controlled stripping team. A high water table, at 0.50m below the ground level was also identified in TP46 and TP47, suggesting flooding of the pipe trench is a possibility in this section. The prevalence of alluvia in the western section needs to also be considered by the controlled stripping team, both for the likelihood that the glacial horizon may not be encountered within the 1.50m limit of excavation for the pipe trench and the potential for the recovery of organic remains, including timber and the requirements for suitable recovery and analysis as determined by the FAWD process (cf para. 3.4)

The central section, north of the A487 (Figure 03 and Figure 04) is characterised by semi-improved pasture. The wetland nature of this area was typified by the identification of peat deposits in Trial Pits TP20, TP21, TP29 and TP31. The peat varied in thickness between 0.50m (TP20) and 1.00m (TP31) leading onto clay-rich glacial till. Very shallow water inflow was recorded from 0.15m in trial pits TP20 and TP21. This is an area of high palaeoenvironmental potential, particularly palynological (pollen) remains. The thickness of the peat (0.50m to 1.00m) suggests the entire sequence of peat deposits above the glacial horizon will be encountered as the maximum pipe trench depth will be greater at 1.50m. The involvement of a palaeoenvironmental specialist from an early stage in the controlled stripping process is a key component of the archaeological programme in this section. The

shallow water table suggests flooding will be an issue during the excavation of the pipe trench.

The eastern section (Figure 05) comprised level pasture leading towards elevated field enclosures: colluvia was identified in three trial pits in the elevated section that varied in thickness between 0.30m and 0.90m beneath the topsoil/subsoil, followed by glacial till; bedrock was encountered in one example – TP15, at 1.05m below ground level. This suggests that the pipe trench in the vicinity of this test pit location will encounter bedrock prior to reaching maximum pipe trench depth. As the colluvia was encountered directly beneath the topsoil in this instance, it is likely the controlled strip for the pipe trench at this point will terminate once the top of the bedrock is reached. The other areas where colluvia was encountered is likely to require the controlled strip of the pipe trench be continued until the glacial horizon is identified (currently expected between 0.30m and 0.90m below the topsoil/subsoil horizon). Along the more level portion of the eastern section, towards the Afon Ddu river valley, two trial pits (TP17 and TP18) recorded 0.40m and 0.21m of topsoil respectively that led onto river alluvials; as with the western section there is the potential for the recovery of organic remains within these deposits.

3. METHODOLOGY

The archaeological evaluation and mitigation methodology below is subdivided into three main sections:

Pre-construction works

- Construction works
- Post-construction phase

3.1 PRE-CONSTRUCTION WORKS (DECEMBER 2012 TO JANUARY 2013):

3.1.1 Geophysical survey of the pipeline transfer route easement and compounds

The geophysical survey will be carried out along the centre line of the working corridor, covering a width of 15m either side. The survey will start at the Dolbenmaen WTW and continue in a linear progression to Cwmystradllyn WTW. The three compound areas are located outside of the working corridor. However they will be included within the geophysical survey, with the exception of Compound 3 which is located within an existing hard standing farm yard. The five small spurs will not be covered by the geophysical survey unless they fall within the 30m grid for the working corridor.

The survey will be carried out in a series of 30m grids, which will be tied into fixed local topographic features. The survey will be conducted using a *Bartington Grad 601-2 Dual Sensor fluxgate gradiometer*. The survey will be carried out at standard resolution (1.0m traverse interval x 0.25m sample interval.). The geophysical survey will be completed by *Stratascan Ltd.* A summary of the *Stratascan* geophysical survey methodology is reproduced in Appendix II.

The geophysical survey will target the entire length of the working corridor. The width of the geophysical survey will include the working corridor plus an extra c. 8m, which will be located where possible in the area furthest away from the current pipeline so as to minimise disturbance and maximise results. Based on the initial results additional surveying may be required to understand the continued extent of identified anomalies; this will be confirmed in a relevant further archaeological works design (FAWD) that will be approved by SNPA and GAPS.

Access onto land is to be arranged by the Clients. The survey is scheduled between 02/12/13 and 10/12/13; a preliminary report is planned to be ready by the end of December. The report will be completed by Stratascan Ltd.

3.1.2 Investigative works targeting the results of the geophysical survey

Based on the results of the geophysical survey, specific anomalies may be targeted for additional information on archaeological content and context. This will be undertaken using targeted trenching. The extent and location of the targeted areas will be defined in a further archaeological works design (FAWD) that will be approved by SNPA and GAPS.

3.1.3 A written and photographic record of all field boundaries affected by the scheme.

This will be completed using GAT pro-formas and a digital SLR camera set to RAW format.

The written record will include a description of the form and construction of the field boundary, a measurement of height, width and length (overall length and the portion within the easement).

Note a construction phase record of the boundaries will also be completed to record the exposed boundary profiles.

3.2 CONSTRUCTION WORKS (JANUARY 2013 TO MARCH 2013):

The identification of archaeological features during the archaeological programme detailed below may necessitate the production of further archaeological works designs (FAWD) for the archaeology encountered. The FAWD will define the appropriate excavation and preservation by record methodology and will be agreed in advance of undertaking the works by SNPA and GAPS. The criteria and methodology for this is discussed in para. 3.4.

The archaeological programme throughout will implement the basic archaeological excavation methodological procedures summarised in para. 3.3.

Throughout the controlled strip process the GAT teams will work alongside a contractor appointed plant operator and banksman and will in all instances work to the client/contractor health and safety protocols.

3.2.1 A controlled topsoil strip within the easement route to accommodate all areas subject to intrusive works;

Based on current information, the intrusive works are limited to a 13.8m wide portion within the 21.8m easement (Figure 6), where the topsoil will be reduced by a mean depth of 100mm. The stripped area will accommodate the following:

- A temporary 5.0m wide haul road built from geotextile membrane and hardstanding (stone) to allow the transportation of personnel and equipment along the easement route and to avoid damage to the stripped surface below;
- A 4.8m wide pipe trench;
- A temporary excavated material bund for the material excavated from the pipe trench;
- Plant and vehicle turning areas, at specific points, built to the same methodology as the haul roads.

The reduction of the topsoil horizon will be completed using contractor plant and GAT personnel and will include 2No teams of at least 2No GAT archaeologists per team. Specific lengths will need to be regularly signed off as complete under the remit of the controlled strip, either if no archaeology is found or has been mitigated subject to a further archaeological works design. The areas will be signed off by the SNPA and GAPS at their respective locations and should not be traversed or covered prior to this. There will be no vehicle traversing outside of the confines of the haul road; vehicles and plant will not traverse the fenced easement prior to the establishment of the haul road.

Note: The removed topsoil will be stored within a fenced area along with the pipes (Figure 6). This area will not be stripped prior to the storage of the topsoil and pipes as it does not require direct vehicle access. The plant will access the pipes and excavated topsoil using the machine arm whilst positioned on the haul road; cf. Figure 06 *for illustrative detail.*

3.2.2 Controlled topsoil strip of the Compounds

The controlled strip will involve a team of at least 2No GAT archaeologists recording the reduction of the compound footprint within the topsoil horizon by the site contractor at each compound. Limit of excavation will be defined by the engineering requirements, but is currently scheduled to be an average depth of 100mm and no deep excavations are currently proposed for the compounds. The stripped area will be covered by geotextile membrane and then hardstanding (stone) to allow the transportation of personnel and equipment into the area and then protect the underlying stripped area. On completion, if no archaeology is found or has been subject to a further archaeological mitigation, then the area will need to be signed off by the SNPA and GAPS and the stripped areas should not be traversed or covered prior to this.

Note: Compound 3 is currently understood to be set on hardstanding (farmyard) and will not include intrusive works and does not form part of the controlled strip.

3.2.3 Controlled strip of the 4.8m wide transfer pipeline trench.

The controlled strip will involve 2No teams of at least 2No GAT archaeologists per team recording the reduction of the pipe trench footprint by the site contractor. Limit of excavation will be defined by the engineering requirements (1.5m deep) or the identification of glacial deposits, whichever is encountered first. On completion, if no archaeology is found or has not been subject to a further archaeological mitigation, then specific lengths will need to be signed off and the excavated area reinstated. The specific lengths will be signed off by the SNPA and GAPS at the respective locations and should not be reinstated prior to this.

Note: the identification of archaeological activity within the pipe trench may require additional mitigation that could include stripping an additional width outside of the 4.8m pipeline trench to fully expose the archaeological features and locate any related features. This could include extending into the areas designated for the temporary excavated material bund and the haul road.

3.2.4 Controlled strip of the directional drilling zone to cross Afon Dwyfor

The controlled strip will involve a team of at least 2No GAT archaeologists recording the reduction of the directional drilling footprint by the site contractor. Limit of excavation will be defined by the engineering requirements or the identification of glacial deposits, whichever is encountered first. On completion, if no archaeology is found or has not been subject to a further archaeological mitigation, then the area will need to be signed off by SNPA and GAPS.

3.2.5 Controlled strip of the 50mm Dolbenmaen village branch pipeline, from Dolbenmaen WTW as far as the A487(T) crossing point c.500m to the east

The controlled strip will involve a team of at least 2No GAT archaeologists. The controlled strip will be limited to the portion of the branch pipeline south of the A487 road (see Figure

01); the remainder of the branch pipeline will be mitigated through an archaeological watching brief. The width of the controlled strip will be 300mm (pipe width is 50mm); limit of excavation will be defined by the engineering requirements (700mm maximum depth) or the identification of glacial deposits, whichever is encountered first. On completion, if no archaeology is found or has been subject to a further archaeological mitigation, then specific lengths will need to be signed off and the excavated area reinstated. The specific length will then be signed off by GAPS prior to reinstatement.

Note: the identification of archaeological activity within the pipe trench may require additional mitigation that could include stripping an additional width outside the branch pipeline trench to fully expose the archaeological features and locate any related features.

3.2.6 A written and photographic record of all field boundaries affected within the easement corridor

The written record will include a description of the form and construction of the field boundary in section and include, a measurement of height, width and length and a record of the profile. For potentially early boundaries samples e.g. of old/buried ground surfaces should be considered - i.e. for soil micromorphology and/or soil pollen could be taken further to the breaching of the field boundaries and the trenching through same. The *Early Fields Project* completed by GAT (Smith, G. 2010 & Smith, G., Caseldine, A., Hopewell, D. and Macphail, R. 2011) studied the general background to early fields and field systems and considered their survival, archaeological value and the effects of modern land use utilising ground survey, geophysical survey, excavation and environmental investigation and provides an indication to the value in collecting samples from any potential buried soils, The *Early Fields Project* also took samples from colluvium within a prehistoric enclosure bank, which produced macrofossils of wheat and barley, as well as corn spurrey, a weed of cultivation and cereal pollen (Smith, G. et al. 2011: 34); this also shows the potential for recovering information from the colluvia and alluvia deposits along the transfer main scheme.

3.2.7 Archaeological watching brief;

An archaeological watching brief will be maintained for the following construction stages:

- the 50mm branch pipeline along Dolbenmaen village road;
- the crossing of the A487(T) road;
- all instances of minor intrusive works, to including 5No pipeline cross connections that will connect the transfer main to existing smaller diameter branch pipes, replacing the existing set up for the 18” main.
- reconnections to all properties

3.2.9 Palaeoenvironmental sampling & Specialist advice and analysis

The location and quantity of palaeoenvironmental samples and any other specialist advice will be defined and in an appropriate further archaeological works designs (FAWD) that will be agreed in advance of undertaking the works by SNPA and GAPS.

3.2.10 Avoidance

Note: Avoidance of all currently known features of archaeological interest in the vicinity of the scheme is to be ensured by their identification to construction contractors etc. and their

fencing or marking-out to prevent ingress of machinery. The known features are listed with Table 1. Similar arrangements will be needed for the reinstatement works to prevent inadvertent damage, both along the easement and within the compounds. This will need to be completed under the supervision of the GAT archaeologist team.

3.3 *BASIC ARCHAEOLOGICAL EXCAVATION METHODOLOGICAL PROCEDURES*

3.3.1 Excavation

All identified features will be recorded using GAT pro-formas and photographed using a digital SLR camera set to RAW format. The extent of the controlled strip areas and any features therein will be located using survey grade (not handheld) GPS with <10cm accuracy (model: *Trimble GNSS/R6/5800*).

All features will be manually cleaned and examined to determine extent, function, date and relationship to adjacent features. The examination strategy will be based on feature type and include an initial 50% sample of sub-circular features and 10% sample of linear features. Any subsequent excavation will be informed by this initial stage and, if required, detailed in an appropriate Further Archaeological Works Design (cf. para. 3.4). Environmental samples will be taken from features where deemed appropriate.

3.3.2 Environmental Samples

Relevant archaeological deposits will be sampled by taking bulk samples (a minimum of 10.0 litres and maximum of 30.0 litres) 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.

Specific palaeoenvironmental strategies for any peat deposits will be discussed with the GAPS and SNPA if encountered and input from a specialist will be sought during the fieldwork on an appropriate sampling strategy to be rationalised in a further archaeological works design.

3.3.3 Human Remains

Any finds of human remains will be left *in-situ*, covered and protected, and both the coroner and GAPS and the SNPA 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.

3.3.4 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.

3.4 *FURTHER ARCHAEOLOGICAL WORKS DESIGN* (*FAWD*) *PROCESS*

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. The requirement for a FAWD will be determined in consultation and liaison with GAPS and SNPA including through 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.

The FAWD document will need to be approved by GAPS and/or SNPA depending on the area in which the work is located.

3.5 MONITORING ARRANGEMENTS

The GAPS and SNPA archaeologists will need to be informed of all start dates for the various elements of the evaluation and on-site mitigation scheme listed and of the subsequent progress and findings. This will allow the curators to arrange monitoring visits and attend site meetings and enable discussion about the need or otherwise for FAWDs as features of potential archaeological significance are encountered. In all instances, liaison will be made with both curators to ensure consistency of approach.

3.6 SIGNING-OFF PROCEDURES

The signing off procedure is designed to identify areas in which construction work can proceed where archaeological evaluation and mitigation has been completed. Responsibility for 'signing-off' areas as having been completed lies with the GAPS and SNPA curators according to their respective areas of jurisdiction. This will be achieved through the monitoring arrangements process.

3.7 AIRBORNE LIDAR DATA

Airborne Lidar (light detection and ranging) measures the height of the ground surface and other features in large areas of landscape and is a spatial analysis tool that can be used to assist in interpreting features in the landscape and can complement the information derived from the geophysical survey and influence the location of archaeological investigation trenches as well interpret features encountered throughout the evaluation and mitigation programme. The *Environment Agency* through their *Geomatics Group* maintain a nationwide archive Lidar data, which includes 1m spatial resolution data for the area traversed by the transfer main, This information will be sourced by GAT for use during the evaluation and mitigation programme.

3.8 REINSTATEMENT

On completion of the transfer main contractor groundworks the easement route will be reinstated. This will include the removal of the haul road and the fencing and the reinstatement of the topsoil and the field boundaries. As part of this, the hardcore and geotextile membrane that formed the haul road will be removed by machine. The compound surfaces will be removed in a similar manner,

An archaeological watching brief will be maintained during this process to monitor the removal of the haul road and compound surface material and the subsequent reinstatement of the topsoil. This will monitor the impact from operating plant on the extant soil horizons beneath the haul road.

3.9 POST-CONSTRUCTION PHASE (POST-MARCH 2013):

As summarised in para. 1.1 the post-construction phase will be managed in accordance with the 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). The five stages are specified:

- MAP2 Phase 1: project planning (WSI)
- MAP2 Phase 2: fieldwork (before and during construction)
- MAP2 Phase 3: assessment of potential for analysis (post construction)
- MAP2 Phase 4: analysis and report preparation (post construction)
- MAP2 Phase 5: dissemination and publication (post construction)

MAP2 Phase 3 involves an objective assessment of the results of the fieldwork phase (MAP2 Phase 2) in order to ascertain the appropriate level of post-excavation analysis and reporting. To accommodate this, the MAP2 Phase 2 data will be processed and quantified and non-GAT specialist input identified.

The requirements will be detailed in an appropriate *assessment of potential for analysis project design* that will need to be approved by SNPA and GAPS prior to undertaking the work.

MAP2 Phase 3 culminates in the production of both a MAP2 Phase 3 report and a project design for MAP2 Phases 4 and 5 The final report will be completed at the culmination of MAP2 Phase 4 and will include the results of all specialist analysis.

MAP2 Phase 5 will involve the dissemination of the approved report to SNPA, GAPS and the regional Historic Environment Record, the dissemination of the archive and any artefacts, and the publication of the results in a journal approved by SNPA and GAPS. The location of the archive and artefact deposition will be subject to discussion with SNPA and GAPS.

4. DISSEMINATION AND ARCHIVING

A full archive including plans, photographs, written material and any other material resulting from the project will be prepared during MAP2 Phase 4 and disseminated as part of MAP2 Phase 5.

- A digital report and archive on optical disc will be provided to GAPS/SNPA (minimum 1 set);
- A digital report and archive on optical disc will be provided to Historic Environment Record, Gwynedd Archaeological Trust (minimum 1 set);
- A digital report and archive on optical disc will be provided to Royal Commission on Ancient and Historic Monuments, Wales (minimum 1 set)
- Appropriate number of paper and/or digital copies be provided to the client (minimum 1 set)

Note: The details and location of documentary and artefactual archives will be subject to discussion with GAPS and SNPA

5. PERSONNEL

The work will be managed by John Roberts, Principal Archaeologist GAT Contracts Section. The evaluation and mitigation archaeological work will be undertaken by a minimum team of 4No GAT archaeologists working in at least 2No teams, based on the current Black & Veatch Ltd. strategy of working on two simultaneous fronts; each team will be led by a GAT Project Officer and will also include a Project Archaeologist. Each officer will manage their section and report to the Principal Archaeologist. The personnel involved will be confirmed prior to the start of the scheme and *curricula vitae* will be distributed at this time

6. HEALTH AND SAFETY

The Trust subscribes to the SCAUM (Standing Conference of Archaeological Unit Managers) Health and Safety Policy as defined in **Health and Safety in Field Archaeology** (2006). Risks will be assessed prior to and during the work.

7. INSURANCE

Liability Insurance - Aviva Policy 24765101CHC/00045

- Employers' Liability: Limit of Indemnity £10m in any one occurrence
- Public Liability: Limit of Indemnity £5m in any one occurrence
- Hire-in Plant Insurance: £50,000.00 any one item;
  £250,000.00 any one claim

The current period expires 21/06/14

Professional Indemnity Insurance – RSA Insurance Plc P8531NAECE/1028

- Limit of Indemnity £5,000,000 any one claim

The current period expires 22/07/14

8. SOURCES CONSULTED

Black and Veatch Drawings 174357-20-9101 Rev A and 174357-20-0404 Rev C and 174357-20-0405 Rev C).

Black and Veatch document ref.: 174357-20-2718-A *Ground Investigation (Wales) Limited* Report

Smith, G. 2010. THE CONSERVATION OF PREHISTORIC SETTLEMENTS AND FIELD SYSTEMS AT MURIAU GWYDDELOD, HARLECH PRELIMINARY REPORT. Gwynedd Archaeological Trust Report 892

Smith, G., Caseldine, A., Hopewell, D. and Macphail, R. 2011. THE NORTH WEST WALES EARLY FIELDS PROJECT. Gwynedd Archaeological Trust Report 933

APPENDIX III: CONTEXT REGISTER

Context No	Area	Type	Description
101	TR01	Topsoil	Dark orangey grey brown clayey silt, 0.25m thick
102	TR01	Subsoil	Dark orangey brown clayey silt, 0.1m thick
103	TR01	Cut	Possible posthole, 0.35m in diameter
104	TR01	Cut	Possible posthole, 0.35m in diameter
105	TR01	Cut	Curvilinear ditch, 1.5m wide
106	TR01	Layer	Concentration of 7-8 sub angular stones
107	TR01	Cut	Linear ditch, 0.8m wide
108	TR01	Natural	Mottled orangey yellow sandy silty clay and gravel
201	TR02	Topsoil	Dark orangey brown clayey silt, 0.2m thick
202	TR02	Subsoil	Dark brownish orange clayey silt, 0.1m thick
203	TR02	Cut	Possible linear ditch, 1.1m wide
204	TR02	Natural	Mottled orangey yellow sandy silty clay and gravel
301	TR03	Topsoil	Brown clayey silt, 0.2m thick
302	TR03	Subsoil	Yellowish grey clayey silt, 0.3m thick
303	TR03	Layer	Dark greyish brown clayey silt, 0.6m thick
401	TR04	Topsoil	Greyish brown clayey silt, 0.2m thick
402	TR04	Subsoil	Dark orangey brown clayey silt, 0.1m thick
403	TR04	Layer	Greyish brown clayey silt, alluvial layer
404	TR04	Layer	Orangey grey clayey silt, alluvial layer
405	TR04	Layer	Dark brown peaty silt
406	TR04	Layer	Greyish orange clayey silt, alluvial layer
407	TR04	Layer	Light brownish grey clayey silt, alluvial layer
501	TR05	Topsoil	Greyish brown clayey silt, 0.25m thick
502	TR05	Subsoil	Orangey brown clayey silt, 0.1m thick
503	TR05	Layer	Lenses of alluvial, light brownish yellow to dark orangey brown
504	TR05	Layer	Mottled orangey brown sandy clay with manganese deposits
505	TR05	Natural	Natural river gravels
601	TR06	Topsoil	Greyish brown clayey silt, 0.12m thick
602	TR06	Subsoil	Light greyish brown clayey silt, 0.15m thick
603	TR06	Natural	Yellowish brown clay and gravel
701	TR07	Topsoil	Light greyish brown clayey silt, 0.15m thick
702	TR07	Subsoil	Light orangey grey clayey silt, 0.1m thick
703	TR07	Layer	Dark brown clayey silt, alluvial
704	TR07	Natural	Light yellowish grey clayey silt
801	TR08	Topsoil	Light greyish brown clayey silt, 0.2m thick
802	TR08	Subsoil	Light orangey brown clayey silt, 0.2m thick
803	TR08	Natural	Bluish grey clay
901	TR09	Topsoil	Light greyish brown clayey silt, 0.2m thick
902	TR09	Subsoil	Orangey brown clayey silt, 0.2m thick
903	TR09	Layer	Black peat, 0.1m thick
904	TR09	Natural	Grey clay
1001	TR10	Topsoil	Brownish grey sandy silt, 0.2m thick
1002	TR10	Subsoil	Light brownish grey clayey loam, 0.1m thick
1003	TR10	Natural	Light yellowish grey sandy clay
1101	TR11	Topsoil	Topsoil, 0.1m thick
1102	TR11	Subsoil	Greyish silty clay, 0.1m thick
1103	TR11	Layer	Orangey brown clayey silt, 0.25m thick

1104	TR11	Natural	Yellowish grey silty clay
1201	TR12	Topsoil	Dark brown silty loam, 0.14m thick
1202	TR12	Subsoil	Greyish brown silty clay, 0.1m thick
1203	TR12	Natural	Grey silty clay
1401	TR14	Topsoil	Brown clayey silt, 0.25m thick
1402	TR14	Subsoil	Orangey brown clayey silt, 0.15m thick
1403	TR14	Natural	Mottled yellowish grey clayey gravel
1501	TR15	Topsoil	Greyish brown clayey silt
1502	TR15	Subsoil	Orangey grey clayey silt, 0.1m thick
1503	TR15	Natural	Mottled orangey grey silty clay
1601	TR16	Topsoil	Greyish brown clayey silt, 0.3m thick
1602	TR16	Subsoil	Orangey grey clayey silt, 0.15m thick
1603	TR16	Natural	Yellowish grey silty clay
1701	TR17	Deposit	Small patch of burning - burnt bioturbation
1702	TR17	Natural	Bioturbation
1703	TR17	Natural	Bioturbation
1704	TR17	Deposit	Small patch of burning - burnt bioturbation
1705	TR17	Topsoil	Greyish brown clayey silt, 0.15m thick
1706	TR17	Subsoil	Orangey brown clayey silt, 0.1m thick
1707	TR17	Natural	Mottled greyish yellow sandy clay
1801	TR18	Natural	Bioturbation
1802	TR18	Natural	Bioturbation
1803	TR18	Natural	Bioturbation
1804	TR18	Natural	Bioturbation
1805	TR18	Natural	Bioturbation
1806	TR18	Cut	Possible posthole, 0.23m in diameter
1807	TR18	Fill	Dark reddish brown silt, fill of [1806]
1808	TR18	VOID	VOID
1809	TR18	Fill	Dark greyish brown silt, fill of [1810]
1810	TR18	Cut	Possible posthole, 0.32m in diameter
1900	TR19	Topsoil	Dark greyish brown silty loam, 0.2m thick
1901	TR19	Subsoil	Reddish brown silt, 0.2m thick
1902	TR19	Structure	Possible post-medieval trackway
1903	TR19	Natural	Grey silty clay
1904	TR19	Fill	Stone layer of possible trackway [1902]
2000	TR20	Topsoil	Dark grey silty loam, 0.16m deep
2001	TR20	Subsoil	Dark grey peaty silt, 0.28m deep
2002	TR20	Natural	Grey silty clay
01001	Field 01	Cut	Curvilinear ditch, 2.4m wide, 1.3m deep
01002	Field 01	Fill	Reddish brown clayey silt, fill of [01020]
01003	Field 01	Fill	Brownish grey silty clay, fill of [01020]
01004	Field 01	Fill	Dark greyish brown clayey silt, fill of [01021]
01005	Field 01	Fill	Greyish brown gritty silt, fill of [01021]
01006	Field 01	Fill	Greyish brown silty clay, fill of [01030]
01007	Field 01	Fill	Reddish brown clayey silt, fill of [01030]
01008	Field 01	Fill	Greyish brown clayey silt, fill of [01029]
01009	Field 01	Fill	Light greyish brown silty clay, fill of [01029]
01010	Field 01	Cut	Linear ditch, 1.33m wide, 0.27m deep
01011	Field 01	Fill	Dark reddish brown silty loam, fill of [01010]
01012	Field 01	Fill	Dark reddish brown gravelly clay, fill of [01010]
01013	Field 01	Cut	Circular posthole or small pit, 0.65m in diameter, 0.15m deep

01014	Field 01	Fill	Greyish brown clayey silt, fill of [01013]
01015	Field 01	Cut	Sub-oval pit, 2.6m x 2.35m, 0.25m deep
01016	Field 01	Fill	Brownish grey clayey silt, fill of [01016]
01017	Field 01	Cut	Posthole, 0.3m in diameter, 0.37m deep
01018	Field 01	Fill	Reddish brown clayey loam, fill of [01020]
01019	Field 01	Fill	Light greyish yellow clayey loam, fill of [01019]
01020	Field 01	Cut	Curvilinear ditch, 2m wide, 1.02m deep
01021	Field 01	Cut	Curvilinear ditch, 2.3m wide, 1.38m deep
01022	Field 01	Fill	Light greyish yellow sandy silt, fill of [01022]
01023	Field 01	Fill	Reddish brown clayey silt, fill of [01023]
01024	Field 01	Fill	Brownish red silty clay, fill of [01020]
01025	Field 01	Fill	Dark reddish brown silt, fill of [01021]
01026	Field 01	Fill	Orangey brown clayey silt, fill of [01021]
01027	Field 01	Fill	Dark reddish brown silt, fill of [01021]
01028	Field 01	Fill	Greenish grey gritty silt, fill of [01021]
01029	Field 01	Cut	Curvilinear ditch, 2.4m wide, 1.33m deep
01030	Field 01	Cut	Curvilinear ditch, 2.18m wide, 1.23m deep
01031	Field 01	Fill	Dark greyish brown clayey silt, fill of [01017]
01032	Field 01	Cut	Posthole, 0.3m in diameter, 0.3m deep
01033	Field 01	Fill	Dark brownish grey clayey silt, fill of [01032]
01034	Field 01	Natural	Bioturbation
01035	Field 01	Natural	Bioturbation
01036	Field 01	Cut	Probable modern posthole, 0.3m in diameter, 0.24m deep
01037	Field 01	Fill	Loose blackish grey clayey silt, fill of [01036]
01038	Field 01	Natural	Bioturbation
01039	Field 01	Natural	Bioturbation
01040	Field 01	Cut	Posthole, 0.3m in diameter, 0.39m deep
01041	Field 01	Fill	Dark brownish grey clayey silt, fill of [01040]
01042	Field 01	Cut	Posthole, 0.3m in diameter, 0.25m deep
01043	Field 01	Fill	Dark brownish grey clayey silt, fill of [01042]
01044	Field 01	Fill	Reddish brown clayey silt, fill of [01030]
01045	Field 01	Fill	Greyish brown clayey silt, fill of [01030]
01046	Field 01	Fill	Reddish brown clayey silt, fill of [01030]
01047	Field 01	Fill	Reddish brown gravelly loam, fill of [01030]
01048	Field 01	Fill	Light greyish yellow clayey loam, fill of [01030]
01049	Field 01	Fill	Reddish brown silty clay, fill of [01030]
01050	Field 01	Fill	Grey silty sand, fill of [01053]
01051	Field 01	Fill	Orangey brown silty sand, fill of [01053]
01052	Field 01	Fill	Dark brown silty sand, fill of [01052]
01053	Field 01	Cut	Circular pit, 1.1m in diameter, 0.45m deep
01054	Field 01	Fill	Greyish brown sandy loam, fill of [01029]
01055	Field 01	Fill	Light greenish grey silty loam, fill of [01029]
01056	Field 01	Fill	Greyish brown sandy loam, fill of [01029]
01057	Field 01	Fill	Brownish grey silty loam, fill of [01029]
01058	Field 01	Fill	Greyish brown sandy loam, fill of [01029]
01059	Field 01	Fill	Orangey brown sandy loam, fill of [01029]
01060	Field 01	Fill	Orangey brown clayey silt, fill of [01029]
01061	Field 01	Fill	Greyish brown gravelly silt, fill of [01029]
01062	Field 01	Fill	Dark greyish brown sandy loam, fill of [01029]
01063	Field 01	Fill	Greyish brown sandy loam, fill of [01029]
01064	Field 01	Fill	Orangey brown sandy loam, fill of [01029]
01065	Field 01	Fill	Orangey brown clayey silt, fill of [01029]

01066	Field 01	Fill	Orangey brown clay, fill of [01029]
01067	Field 01	Fill	Reddish brown clayey silt, fill of [01069]
01068	Field 01	Fill	Reddish brown and black clayey silt and charcoal, fill of [01069]
01069	Field 01	Cut	Roughly square pit, 0.95x0.86m, 0.2m deep
01070	Field 01	Cut	Linear ditch, 5m long, 0.65m wide, 0.25m deep
01071	Field 01	Fill	Greyish brown sandy silt, fill of [01070]
01072	Field 01	Void	Void
01073	Field 01	Cut	Linear gully, 5.5m long, 0.5m wide, 0.1m deep
01101	Field 01	Cut	Oval pit, 0.65x0.4m, 0.35m deep
01102	Field 01	Cut	Oval pit, 1.9x1.2m, 0.4m deep
01103	Field 01	Cut	Oval pit, 0.7x0.6m, 0.13m deep
01104	Field 01	Fill	Stone and gravel, fill of [01102]
01105	Field 01	Fill	Black charcoal, fill of [01103]
01106	Field 01	Fill	Greyish brown clayey silt, fill of [01107]
01107	Field 01	Cut	Circular pit, 1.1m in diameter, 0.25m deep
01108	Field 01	Fill	Dark reddish brown sandy loam, fill of [01101]
01109	Field 01	Cut	Linear ditch, 0.8m wide, 0.13m deep
01110	Field 01	Fill	Mottled greyish brown clayey silt, fill of [01109]
01111	Field 01	Cut	Linear ditch, 1.4m wide, 0.15m deep
01112	Field 01	Fill	Orangey brown silty clay, fill of [01111]
04001	Field 04	Topsoil	Topsoil
04002	Field 04	Subsoil	Subsoil
04003	Field 04	Layer	Dark reddish brown peat layer
04004	Field 04	Deposit	Spread of burnt stone
05001	Field 05	Structure	Stone trackway
09000	Field 09	Topsoil	Topsoil
09001	Field 09	Subsoil	Subsoil
09002	Field 09	Natural	Natural
09003	Field 09	Cut	Oval pit, 1.55x0.9m, 0.3m deep
09004	Field 09	Fill	Light reddish brown sandy silt, fill of [09004]
09005	Field 09	Cut	Circular pit or posthole, 0.38m in diameter, 0.12m deep
09006	Field 09	Fill	Dark grey sandy silt, fill of [09005]
09007	Field 09	Cut	Circular pit or posthole, 0.68m in diameter, 0.22m deep
09008	Field 09	Fill	Dark reddish brown sandy silt, fill of [09007]
09009	Field 09	Cut	Linear ditch, 2.84m wide, 1m deep
09010	Field 09	Fill	Light bluish grey sandy silt, fill of [09009]
09011	Field 09	Cut	Linear field drain
09012	Field 09	Structure	Stone field drain, fill of [09011]
09013	Field 09	Fill	Light greyish brown silty clay, fill of [09011]
09014	Field 09	Fill	Light greyish brown silty clay, fill of [09011]
09015	Field 09	Fill	Greyish brown sandy loam, fill of [09011]
09016	Field 09	Fill	Dark brown silty clay, fill of [09011]
09017	Field 09	Fill	Greyish brown sandy loam, fill of [09011]
09018	Field 09	Fill	Greyish brown clayey silt, fill of [09009]
09019	Field 09	Cut	Squarish pit, 0.5x0.37m, 0.28m deep
09020	Field 09	Fill	Reddish brown clayey silt, fill of [09019]
09021	Field 09	Cut	Irregular pit, 1.5x1.3m, 0.14m deep
09022	Field 09	Fill	Dark reddish brown clayey silt, fill of [09021]
09023	Field 09	Cut	Oval pit, 0.77x0.37m, 0.09m deep
09024	Field 09	Fill	Greyish brown clayey silt, fill of [09023]
09025	Field 09	Surface	Bluish grey sandy clay and gravel surface
09026	Field 09	Surface	Cobbled road surface

09027	Field 09	Cut	Sub-rounded pit 7.3x4.8m
09028	Field 09	Fill	Sub-angular stone deposit
09029	Field 09	Cut	Sub-circular pit 4.6x3.3m, >0.5m deep
09030	Field 09	Layer	Greyish brown clayey silt and gravel
09031	Field 09	Cut	Linear foundation cut for wall [09032]
09032	Field 09	Structure	NW-SE aligned stone wall
09033	Field 09	Fill	Light bluish grey clayey silt, fill of [09031]
09034	Field 09	Cut	Sub-circular pit 2.36x1.3m, 0.2m deep
09035	Field 09	Fill	Reddish brown clayey silt, fill of [09034]
09036	Field 09	Layer	Bluish grey clayey silt
09037	Field 09	Fill	Greyish brown clayey silt, fill of [09029]
09038	Field 09	Fill	Bluish grey sandy loam, fill of [09029]
09039	Field 09	Cut	Possible linear ditch, 0.95m wide, 0.19m deep
09040	Field 09	Surface	Compacted stone surface (possibly natural)
09041	Field 09	Cut	Possible linear ditch, 1.7m wide, 0.35m deep
09042	Field 09	Fill	Sub-rounded stones, fill of [09041]
09043	Field 09	Fill	Bluish grey clayey silt, fill of [09041]
09044	Field 09	Fill	Reddish brown clayey silt, fill of [09041]
09045	Field 09	Layer	Yellowish brown silty clay
09046	Field 09	Structure	Slate capped drain
09047	Field 09	Feature	Possible furrow
09048	Field 09	Natural	Bioturbation
09049	Field 09	Feature	Possible furrow
09050	Field 09	Feature	Shallow burnt pit/ bioturbation
09051	Field 09	Natural	Stone-hole
09052	Field 09	Cut	Same as [09009]
09053	Field 09	Natural	Bioturbation
09054	Field 09	Natural	Bioturbation/ hedge boundary
09055	Field 09	Deposit	Stone dump
09056	Field 09	Cut	Same as [09007]
09057	Field 09	Natural	Bioturbation/ hedge boundary
09058	Field 09	Feature	Possible furrow
09059	Field 09	Cut	Same as [09023]
11001	Field 11	Fill	Brownish grey silty clay, fill of [11002] and [11003]
11002	Field 11	Cut	Possible oval pit, 0.8x0.6m, 0.14m deep
11003	Field 11	Natural	Bioturbation
11004	Field 11	Fill	Brownish orange clayey silt, fill of [11005]
11005	Field 11	Cut	Possible irregular pit, 1.72x1.32m, 0.45m deep
14001	Field 14	Deposit	Spread of stones, possible robbed out wall
15001	Field 15	Cut	Linear ditch, 2m wide, 0.36m deep
15002	Field 15	Fill	Greyish brown silty clay, fill of [15001]
15003	Field 15	Deposit	Reddish brown clayey silt and stone deposit
15004	Field 15	Cut	Possible posthole, 0.5m in diameter, 0.14m deep
15005	Field 15	Fill	Greyish brown clayey silt, fill of [15004]
15006	Field 15	Cut	Possible squarish pit, 0.32x0.3m, 0.17m deep
15007	Field 15	Fill	Dark brown silty clay, fill of [15006]
15008	Field 15	Cut	Probable stone-hole
15009	Field 15	Fill	Brown silty clay, fill of [15008]
15010	Field 15	Structure	Stone wall foundation
15011	Field 15	Natural	Natural concentration of stones
15012	Field 15	Structure	Trackway
15013	Field 15	Feature	Modern ditch

18001	Field 18	Fill	Bluish grey clayey silt, fill of [18003]
18002	Field 18	Fill	Bluish grey sandy loam, fill of [18003]
18003	Field 18	Cut	Linear ditch/ drain, 1.4m wide, 0.37m deep
18004	Field 18	Void	Void
18005	Field 18	Void	Void
18006	Field 18	Fill	Orangey brown silty clay, fill of [18003]
18007	Field 18	Structure	Stone structure over natural spring
20000	Field 20	Structure	Stone trackway
20001	Field 20	Natural	Bank
20002	Field 20	Natural	Bank
20003	Field 20	Feature	Drain
27001	Field 27	Fill	Dark brownish black clayey silt, fill of [27001]
27002	Field 27	Cut	Oval pit?, 0.74x0.47m, 0.11m deep
27003	Field 27	Cut	Irregular feature, 1.5x1.35m, 0.47m deep
27004	Field 27	Fill	Cobble/ stone deposit, fill of [27003]
27005	Field 27	Cut	Possible sub-rectangular pit, 2.65x>0.77m, 0.65m deep
27006	Field 27	Fill	Dark orangey brown clayey silt, fill of [27003]
27007	Field 27	Fill	Dark brown clayey silt, fill of [27003]
27008	Field 27	Fill	Brownish orange clayey silt, fill of [27003]
27009	Field 27	Layer	Ploughsoil
27010	Field 27	Fill	Orangey brown clayey silt, fill of [27005]
27011	Field 27	Fill	Dark greyish brown clayey silt, fill of [27005]
27012	Field 27	Fill	Brown clayey silt, fill of [27005]
27013	Field 27	Deposit	Slate dumped deposit
29001	Field 29	Fill	Brownish grey clayey silt, fill of [29002]
29002	Field 29	Cut	Linear ditch, 1.7m wide, 0.38m deep
29003	Field 29	Fill	Brownish grey clayey silt, fill of [29004]
29004	Field 29	Cut	Linear ditch, 2.1m wide, 0.39m deep
32001	Field 32	Topsoil	Topsoil
32002	Field 32	Subsoil	Subsoil
32003	Field 32	Natural	Natural
32004	Field 32	Cut	Drain
32005	Field 32	Fill	fill of [32004]
32006	Field 32	Cut	Linear ditch?
32007	Field 32	Fill	fill of [32006]
32008	Field 32	Void	Void
32009	Field 32	Void	Void
39001	Field 39	Structure	Stone platform, 5.8x4.1m
39002	Field 39	Cut	Linear ditch, 1.05m wide, 0.35m deep
39003	Field 39	Fill	Light greyish brown, fill of [39002]
39004	Field 39	Feature	Field drain
39005	Field 39	Cut	Sub-circular pit 2.81x2.3m, 0.76m deep
39006	Field 39	Fill	Greyish brown silty clay, fill of [39005]
39007	Field 39	Fill	Brownish orange clayey silt, fill of [39005]
39008	Field 39	Fill	Reddish brown clayey silt, fill of [39005]
39009	Field 39	Fill	Brownish orange clayey silt, fill of [39005]
39010	Field 39	Fill	Orangey brown clayey silt, fill of [39005]
39011	Field 39	Cut	Irregular pit, 1.7x1.3m, 0.7m deep
39012	Field 39	Fill	Greyish brown clayey silt, fill of [39011]
39013	Field 39	Fill	Greyish brown clayey silt, fill of [39014]
39014	Field 39	Cut	Circular pit, 1m in diameter, 0.18m deep
39015	Field 39	Deposit	Layer of black silty sand and stones

39016	Field 39	Fill	Light yellowish brown silt, fill of [39011]
39017	Field 39	Cut	Sub-rectangular pit, 1.1x1.05m, 0.33m deep
39018	Field 39	Fill	Greyish brown silty clay, fill of [39017]
39019	Field 39	Cut	Pit, 2.05x>1.45m, 0.55m deep
39020	Field 39	Fill	Same as (39024)
39021	Field 39	Cut	Linear field drain
39022	Field 39	Fill	Greyish brown silty clay, fill of [39021]
39023	Field 39	Fill	Brownish grey silty sand, fill of [39019]
39024	Field 39	Fill	Dark brownish grey clayey silt, fill of [39019]
39025	Field 39	Fill	Light brownish grey sandy loam, fill of [39019]
39026	Field 39	Fill	Same as (39024)
39027	Field 39	Deposit	Stone layer/ dump
39028	Field 39	Cut	Same as [39019]
39029	Field 39	Fill	Same as (39024)
39030	Field 39	Natural	Natural
39031	Field 39	Natural	Natural
39032	Field 39	Fill	Brownish grey clayey silt, fill of [39017]
39033	Field 39	Fill	Greyish brown sandy silt, fill of [39017]
39034	Field 39	Layer	Light grey clayey silt interface layer
39035	Field 39	Natural	Natural
39036	Field 39	Layer	Same as (39015) just disturbed
39037	Field 39	Layer	Same as (39034)
42001	Field 42	Feature	Drainage ditch
42002	Field 42	Natural	Natural stones
42003	Field 42	Feature	Drainage ditch
42004	Field 42	Fill	Dark brown peaty silt, fill of [42003]
42005	Field 42	Fill	Dark brown peaty silt, fill of [42001]
42006	Field 42	Cut	Possible posthole, 0.4m in diameter, 0.26m deep
42007	Field 42	Fill	Greyish brown sandy loam, fill of [42006]
43001	Field 43	Feature	Drainage ditch associated with field boundary wall
44001	Field 44	Feature	Shallow drainage gully
44002	Field 44	Deposit	Small natural concentration of stones
44003	Field 44	Feature	Drainage ditch
45001	Field 45	Feature	Natural spring
48001	Field 48	Feature	Modern pit
48002	Field 48	Structure	Slate capped drain
48003	Field 48	Fill	Brown silty sand, fill of [48004]
48004	Field 48	Cut	Linear ditch, 1.1m wide, 0.1m deep
48005	Field 48	Cut	Linear ditch, 1m wide, 0.36m wide
48006	Field 48	Fill	Light greenish grey silty clay, fill of [48005]
50001	Field 50	Structure	Stone wall
50002	Field 50	Layer	Dumped deposit of slate
50003	Field 50	Fill	Brown silty sand, fill of [50004]
50004	Field 50	Cut	Linear ditch, 2.6m wide, 0.2m deep
50005	Field 50	Fill	Grey silty clay, fill of [50004]
50006	Field 50	Natural	Natural depression
50007	Field 50	Natural	Natural
51001	Field 51	Fill	Grey silty clay, fill of [51002]
51002	Field 51	Cut	Linear ditch, 2.8m wide, 0.2m deep
51003	Field 51	Feature	Field drain
55000	Field 55	Fill	Brown silty sand, fill of [55001]
55001	Field 55	Cut	Linear ditch, 1.4m wide, 0.18m deep

66001	Field 66	Cut	Linear ditch, 1.78m wide, 0.38m deep
66002	Field 66	Fill	Reddish brown clayey silt, fill of [66001]
66003	Field 66	Fill	Light yellowish brown clayey silt, fill of [66001]
66004	Field 66	Cut	Linear ditch, 1.1m wide, 0.2m deep
66005	Field 66	Fill	Greyish brown clayey silt, fill of [66004]

APPENDIX IV: FIELD BOUNDARIES

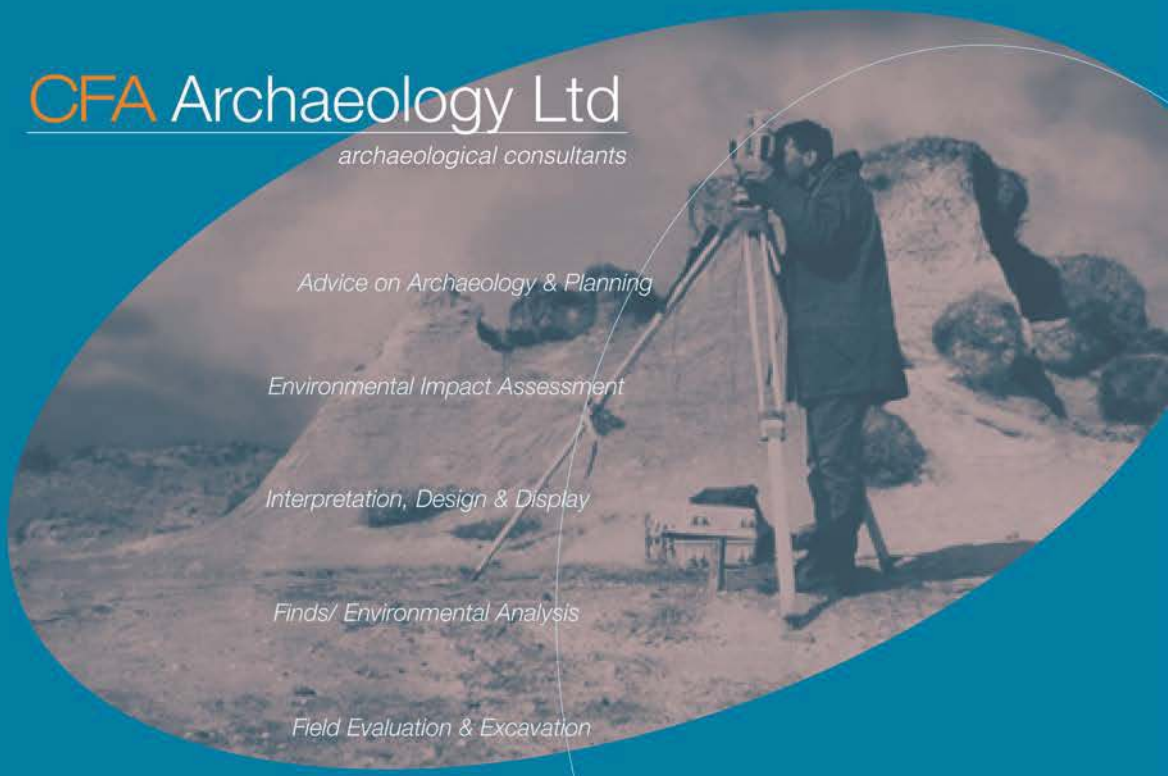
Field Boundary	Width	Height	Description
02	1m	2.4m	Hedgebank and fence
03	1.2m	0.8m	Hedgebank and fence
04	1.5m	0.8m	Stone wall and fence
05	-	1.2m	Fence
06	3m	1.5m	Hedge and fence
07	0.6m	0.3m	Bank and fence
08	1.5m	1m	Bank, wall, and fence
09	-	1.2m	Fence
10	1.6m	0.9m	Bank and fence
11	-	1m	Fence
12	-	1m	Fence
13	-	1m	Fence
14	-	1.3m	Fence
15	1m	0.7m	Hedgebank and ditches
16	0.8m	0.85m	Stone wall
17	0.9m	0.9m	Stone wall
18	0.7m	0.7m	Stone wall
19	0.6m	0.8m	Stone wall
20	0.9m	1.3m	Stone wall and fence
21	0.6m	1m	Stone wall
22	0.7m	0.7m	Stone wall and fence
23	0.6m	1.3m	Stone wall, fence, and ditch
24	1m	1.2m	Stone wall and fence
25	-	1.1m	Fence
26	0.8m	0.9m	Stone wall
27	1m	1.3m	Stone wall
28	1.2m	1m	Stone wall
29	2.4m	0.7m	Bank
30	-	-	-
31	1.1m	1.1m	Stone wall and fence
32	0.8m	0.8m	Stone wall
33	0.6m	0.8m	Stone wall
34	-	1m	Fence
35	0.8m	1.4m	Stone wall and fence
36	0.6m	0.8m	Stone wall
37	1.8m	0.4m	Bank
38	-	-	Bank and fence
39	-	-	Bank
40	3.6m	1.7m	Ditch
41	0.9m	0.9m	Stone wall and fence
42	-	1.1m	Fence
43	2m	1.12m	Bank and ditches
44	2.15m	0.8m	Bank and ditch
45	3.5m	1.75m	Bank and ditches
46	1.5m	0.9m	Bank, wall, and ditch

47	1.2m	1.1m	Bank and ditches
48	0.9m	1m	Bank, fence, and ditch
49	-	-	Bank
50	1.2m	0.9m	Bank, fence, and ditch
51	2m	1.3m	Bank, fence, and ditch
52	0.7m	0.8m	Stone wall
53	0.5m	1.2m	Stone wall and fence
54	0.85m	0.6m	Hedgebank and fence
55	0.8m	1.2m	Stone wall and fence
56	0.6m	1m	Stone wall
57	0.7m	1.2m	Stone wall
58	0.8m	1.3m	Stone wall
59	1m	0.8m	Stone wall
60	0.7m	1.1m	Stone wall
61	0.7m	1.2m	Stone wall
62	0.9m	1.16m	Stone wall
63	1.8m	0.9m	Bank and stone wall
64	0.7m	1.2m	Stone wall
65	0.6m	0.5m	Stone wall

APPENDIX V: PALAEOENVIRONMENTAL REPORT

CFA Archaeology Ltd

archaeological consultants



Advice on Archaeology & Planning

Environmental Impact Assessment

Interpretation, Design & Display

Finds/ Environmental Analysis

Field Evaluation & Excavation

Historic Building Recording

Site & Landscape Survey

Geophysical Survey

Transfer Pipeline Between Dolbenmaen Water Treatment Works and Cwmystradllyn Water Treatment Works (G2231)

Sample Assessment

Report No. 3251

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Transfer Pipeline Between Dolbenmaen Water Treatment Works and Cwmystradllyn Water Treatment Works (G2231)

Sample Assessment

Report No: 3251

1. INTRODUCTION

Twenty-six bulk soil samples were retained for palaeoenvironmental analysis during a phased programme of archaeological investigations carried out in 2014 along the pipeline route between the Dolbenmaen and Cwmystradllyn Water Treatment Works by Gwynedd Archaeological Trust. The soil samples were provided to CFA Archaeology Ltd (CFA) in January 2015 for processing and assessment.

2. METHODOLOGY

The soil samples, which ranged from 10-30 litres in volume, were processed through a flotation tank.

The floating material (flot) was collected in a 250μm sieve then, once dried, scanned using a binocular microscope (x10-x100 magnifications) and any carbonised plant remains extracted and preliminary identified. Where flots contained large quantities of charcoal and/or other carbonised plant remains, the flot was sub-sampled using a riffle box, and a proportion of the plant remains sorted and identified. The proportion of flot assessed is noted in Appendix 1. Identifications of plant remains were made with reference to the modern collection of CFA and standard seed atlases. Plant remains were stored in either plastic finds bags or plastic specimen tubes.

The retents were scanned for any archaeological significant material. The quantity and quality of any artefacts and small finds present in the retents were noted and the remains stored in plastic find bags.

The quantity of plant remains and small finds (etc) were recorded using a four-point scale (see Table 1). The results are presented in Appendix 1 (Composition of Flots) and Appendix 2 (Composition of Retents), organised by sample number.

Table 1. Four point scale

Scale	Abundance	Approx. quantity
+	Rare	1-10 items
++	Occasional	11-50 items
+++	Common	51-100 items
++++	Abundant	101+ items

3. RESULTS

The bulk of the samples contained some carbonised plant remains including wood charcoal, cereal grains, hazelnut shell and weed seeds (or wild taxa). Wood charcoal was the most abundant material recovered from the samples.

For ease of discussion the material recovered from the sample is discussed, below, by field number.

Field 1: The bulk of the carbonised plant remains and other material (including one small fragment of burnt flint and some fragments of burnt bone) were recovered from features uncovered in Field 1. The fills of a curvilinear ditch [**1001,** fills **1021**, **1029**] and associated post-holes [**1017**, **1036**, and **1040**] contained a small assemblage of carbonised cereal grain and seeds of wild taxa (weed seeds).

The cereal grains were generally poorly preserved and abraded. Wheat was the most common species identified along with smaller amounts of barley and occasional grains of oat. The wheat grains were characteristic of hulled wheat, emmer/spelt (*Triticum dicoccum*/*spelta*. Neither the barley (*Hordeum* sp.) nor the oat (*Avena* sp.) grains were sufficiently well-preserved to allow identification to species level. The plant assemblage, dominated by hulled wheat and barley, would be consistent with a prehistoric date for these features and their presence, albeit in small amounts, does suggest that some food processing was bring carried out at the site.

Occasional weed seeds were also recovered from ditch [**1001**] and postholes [**1017**, **1040**]. In all cases these were much abraded. The taxa present were common seeds of waste places and grassland, including knotgrass (*Polygonum* sp.); ribwort/plantain (*Plantago* sp.) and Gramineae indet (grasses). The seeds could have been either growing on, or near to, the site or brought to the site along with the cereal grains.

Fragments of burnt peat were recovered from the fill of ditch [**1001**, fills **1021** and **1029**]. The recovery of such material along with a small assemblage of cereal grain suggests that the carbonised plant remains are remnants of a domestic hearth which have accumulated in the ditch and associated pit fills.

Field 4: Small fragments of wood charcoal were recovered from a deposit (**4003**) uncovered in Field 4. The charcoal was very fragmentary and in most cases below the level of identification. None would be suitable for dating purposes. No other plant remains or small finds/artefacts were recovered from this deposit.

Field 9: Large concentrations of wood charcoal were recovered from three pits uncovered in Field 9. The charcoal consisted of blocky fragments of oak charcoal, and would not be suitable for AMS dating. In addition,

occasional fragments of carbonised hazelnut shell were recovered from the fills of two pits [**9005**, **9019**]. Preservation of the nutshell varied, and sufficiently large enough fragments of nutshell for AMS dating were recovered from one of the pits [**9005**]. No other plant remains or small finds/artefacts were recovered from this deposit.

Field 27: Seven much abraded fragments of hazelnut shell were recovered from one pit [**27002**] uncovered in Field 27. The nutshell was found along with small abraded wood charcoal fragments that were present in the pit fill and one other pit [**27003**]. The wood charcoal was very fragmentary and below the level of identification (BLOI). None of the carbonised plant remains recovered from these features is suitable for AMS dating. No other plant remains or small finds/artefacts were recovered from this deposit.

Field 39: High concentrations of wood charcoal were recovered from the fill of a pit [**39019**] and a deposit [**39015**]. Preliminary identification of the charcoal indicates that a mixture of small round wood fragments of oak and non-oak species (such as hazel, alder, etc) were present and sufficiently large enough fragments of charcoal were recovered for dating purposes. In addition, one small, abraded, fragment of hazelnut shell was recovered from the fill of pit [**39019**]. No other plant remains or small finds/artefacts were recovered from this deposit.

Field 42: A large quantity of fragmentary indeterminate (BLOI) wood charcoal was recovered from one posthole (**42006**) together with one cereal grain and two small fragments of hazelnut shell. The cereal grain was much abraded and could not be identified.

A concentration of carbonised peat was recovered from the fill of what has been identified as a possible drainage ditch [**42001**]. The peat was recovered along with a small amount of heather charcoal, suggesting that the material is remnants of peaty turfs. The origin of this material is unknown, although it may be an accumulation of domestic debris that has been spread on the fields.

No other plant remains or small finds/artefacts were recovered from this deposit.

Table 2. Summary Table: Carbonised Plant Remains

Key: + = rare (1-10 items), ++ = occasional (11-50 items), +++ = (51-100 items), and ++++ = abundant (101+ items)

Feature type	Fill/ Feature no	Approx. Flot vol (ml	Cereal grain	Weed seeds	Nutshell	Peat Frags.	Rhizomes	Charcoal
FIELD 1								
Ditch	1021	30	+			+++		++
Ditch	1029	120	++	+		+	+	++
Ditch	1070	20						+
Deposit	1039	10			+			+
Posthole	1017	10	++	+				+
Posthole	1036	10	+					+
Posthole	1040	20	+	+			+	+
Posthole	1042	20						+
Pit	1053	20			+			+
Pit	1069	750						++++
Pit	1103	500			+			++++
FIELD 4								
Deposit	4003	100						+
FIELD 9								
Pit	9005	20			+			++
Pit	9019	100			++			+++
Pit	9023	500						++++
FIELD 27								
Pit	27002	20						+
Pit	27003	10			+			+
FIELD 39								
Deposit	39015	1000						++++
Pit	39019	600			+			++++
FIELD 42								
Ditch	42001	500				++++		+
Posthole	42006	30	+		+			+++

4. RECOMMENDATIONS

- Sufficiently well-preserved cereal grain and nutshell suitable for AMS dating are present in:

  - Sample 002 (Context 9020, Pit 9019) – hazelnut shell
  - Sample 007 (Context 1031, Posthole 1017) – cereal grain
  - Sample 011 (Context1041, Pit 1040) – cereal grain
  - Sample 013 (Context 1052, Pit 1053) – hazelnut shell
  - Sample 015 (Context 1008, Ditch 1029) – cereal grain
  - Sample 025 (Context 1105, Pit 1103) – hazelnut shell

- Sufficiently large enough fragments of charcoal suitable for AMS dating are present in:

  - Sample 007 (Context 1031, Pit 1017)
  - Sample 011 (Context 1041, Posthole 1040)
  - Sample 015 (Context 1008, Pit 1029)
  - Sample 020 (Context 1066, Ditch 1029 – Feature 1001)
  - Sample 021 (Context 1004, Ditch 1021 – Feature 1001)
  - Sample 026 (Context 39020, Pit 39019)
  - Sample 027 (Context 3920, Pit 39019)

  The species of cereal grain or wood charcoal present would require to be identified prior to submission for dating.

- Further detailed analysis of the carbonised plant remains would add little to that provided above.

Appendix 1. Composition of Flots

Key: + = rare (1-10 items), ++ = occasional (11-50 items), +++ = common (51-100 items) & ++++ = abundant (101+ items)
PH = posthole, PIT = pit, DIT = ditch, DEP = deposit/layer, NAT = natural
BLOI = Below Level of Identification
* = sufficiently large enough fragments/well-preserved material suitable for AMS dating

Sample No.	Context No.	Field No.	Fill of.	Feature type	Total Sample vol (litres)	Approx. Flot vol (ml)	Flot fraction assessed	Cereal grain				Weed seeds (Wild taxa)			Hazelnut shell			Peat Frags.	Rhizomes	Charcoal			Comments
								Qty	Id.	Pres.	AMS	Qty	Id.	Pres.	Qty	Pres.	AMS			Qty	Id.	AMS	
001	9006	9	9005	PIT/PH	10	20	100%													++	BLOI		Flot contains a large amount of modern root debris
002	9020	9	9019	PIT	10	100	100%								++	Varied	*			+++	Oak charcoal – blocky fragments		
003	9024	9	9023	PIT	10	500	50%													++++	Oak charcoal – blocky fragments		
004	27001	27	27002	PIT	10	20	100%													+	BLOI		
005	27004	27	27003	PIT	10	10	100%								+	Much abrade d and fragmentary				+	BLOI		Flot contains a large amount of modern root debris and moss frags.
007	1031	1	1017	PH	10	10	100%	+	*Triticum* sp. (cf. emmer)	Abraded	*	+	cf. *Gramineae* indet	Much abraded						+	Mixture of oak and small round wood	*	
009	1037	1	1036	PH	10	10	100%													+	Mostly BLOI – other fragments principally oak		Flot contains a large amount of modern root debris
010	1039	1	-	NAT(?)	10	10	100%													+	BLOI		Flot contains a large amount of modern root debris
011	1041	1	1040	PH	10	20	100%	+	*Triticum* sp. (emmer/spelt)	Varied Preservation	*	+	*Plantago* sp. cf. *Polygonum* sp.	Much abraded					+	+	Mixture of oak and small round wood	*	
012	1043	1	1042	PH	10	20	100%													+	Principally oak		
013	1052	1	1053	PIT	30	20	100%													+	BLOI		Flot principally modern root debris and frags. of moss
014	1071	1	1070	DIT	30	20	100%													+	BLOI		Flot principally modern root debris
015	1008	1	1029	DIT	30	50	100%	++	*Triticum* sp. (emmer/spelt) *Avena* sp.	Abraded	*	+	*Polygonum* sp.	Abraded						+	Mixture of oak and small round wood	*	Flot contains a large amount of modern root debris
016	1009	1	1029	DIT	10	20	100%	+	*Triticum* sp.	Abraded									+	+	BLOI		Flot principally modern root debris
017	1068	1	1069	PIT	10	750	25%													++++	Oak charcoal – block fragments		
018	1054	1	1029	DIT	30	20	100%	+	cf. *Hordeum* sp.	Abraded										+	Mostly BLOI – other fragments principally oak		Charcoal vitrified Flot principally modern root debris and
019	1062	1	1029	DIT	30	20	100%	+	*Triticum* sp.	Abraded										+	BLOI		Flot principally modern root debris – including some grass frags.
020	1066	1	1029	DIT	20	10	100%													+	Mostly BLOI – occ. Fragments of small round wood	*	Flot principally modern root debris – including some grass frags.
021	1004	1	1021	DIT	10	30	100%	+	cf. *Triticum* sp. cf. *Hordeum* sp.	Much Abraded								+++		++	Round wood fragments Heather charcoal	*	
022	4003	4	-	DEP	30	100	100%													+	BLOI		Flot principally modern root debris
023	42001	42	42001	DIT	10	500	50%											++++		+	Heather charcoal		
024	42007	42	42006	PH	10	30	100%	+	Indeterminate	Much Abraded					+	Much abraded				+++	BLOI		
025	1105	1	1103	PIT	10	500	100%								+	Much abraded	*			++++	Oak charcoal – blocky fragments		
026	39020	39	39019	PIT	10	100	100%													++++	Mixture of oak and small round wood	*	
027	39023	39	39019	PIT	10	500	50%													++++	Mixture of oak and small round wood	*	
028	39015	39	-	DEP	30	1000	25%													++++	Mixture of oak and small round wood	*	

Appendix 2. Composition of plant remains from Phase 2 (2013)

Key: + = rare (1-10 items), ++ = occasional (11-50 items), +++ = common (51-100 items) & ++++ = abundant (101+ items)
PH = posthole, PIT = pit, DIT = ditch, DEP = deposit/layer, NAT = natural
BLOI = Below Level of Identification
* = sufficiently large enough fragments/well-preserved material suitable for AMS dating

Sample number	Context number	Field no	Fill of	Feature type	Total sample vol (litres)	Pot (modern)	Glass (modern)	Burnt Flint	Burnt Bone	Cereal grain				Nutshell			Charcoal			Peat
										Qty	Id.	Pres.	AMS	Qty	Pres.	AMS	Qty	Id.	AMS	
001	9006	9	9005	PIT/PH	10									+	Abraded		+	BLOI		
002	9020	9	9019	PIT	10												+	Oak		
003	9024	9	9023	PIT	10												+	BLOI		
004	27001	27	27002	PIT	10												+	BLOI		
005	27004	27	27003	PIT	10												+	BLOI		
007	1031	1	1017	PH	10					++	*Triticum* (emmer/spelt)	Well-preserved	*				+	BLOI		
009	1037	1	1036	PH	10					+	cf. *Triticum* sp.	Abraded and fragmentary					+	BLOI		
010	1039	1	-	NAT?	10									+	Much abraded		+	BLOI		
011	1041	1	1040	PH	10												+	BLOI		
012	1043	1	1042	PH	10												+	BLOI		
013	1052	1	1053	PIT	30	+ (SF)	+ (SF)							+	Slightly abraded	*	+	BLOI		
014	1071	1	1070	DIT	30												+	BLOI		
015	1008	1	1029	DIT	30					+	Indeterminate	Much abraded and fragmentary					+	Oak		
016	1009	1	1029	DIT	10												+	BLOI		
017	1068	1	1069	PIT	10												+	Oak		
018	1054	1	1029	DIT	30			+ (SF)		+	*Triticum* sp.	Much abraded					+	Oak		
019	1062	1	1029	DIT	30				+ (SF)								+	BLOI		+
020	1066	1	1029	DIT	20				+ (VSF)								+	Oak and small round wood		
021	1004	1	1021	DIT	10												+	BLOI		
022	4003	4	-	DEP	30												+	Small round wood		
023	42001	42	42001	DIT	10															+
024	42007	42	42006	PH	10												+	BLOI		
025	1105	1	1103	PIT	10									+	Slightly abraded	*	+	BLOI		
026	39020	39	39019	PIT	10									+	Possible nutshell frag. – much abraded		+	BLOI		
027	39023	39	39019	PIT	10												+++	Oak		
028	39015	39	-	DEP	30												+++	Oak		

APPENDIX VI: AUGER SURVEY AND CORING REPORT

Garndolbenmaen – Cwystradllyn water pipeline scheme, North Wales
Auger Survey, Coring and initial assessment

Introduction

A series of test pits undertaken as part of the Ground Investigation survey along the Garndolbenmaen – Cwystradllyn WTW Pipeline (Ground Investigation Ltd 2013) identified a series of locations where peat deposits and fine grained organic river alluvium were present. These deposits have the potential to hold an 'archive' of the local environmental history, specifically the vegetation history, of the area for the periods during which the peats and organic silts accumulated. It was anticipated that other areas not investigated during the ground investigation may also hold organic deposits of palaeoenvironmental potential so a survey was proposed.

As part of a programme of archaeological mitigation along the Garndolbenmaen – Cwystradllyn WTW Pipeline construction an auger survey and core sampling programme (Rackham 2014) was conducted along the route where peat deposits of a depth of more than 0.4m had been recorded during the geotechnical survey and at other locations established by probing during a walkover of the whole route.

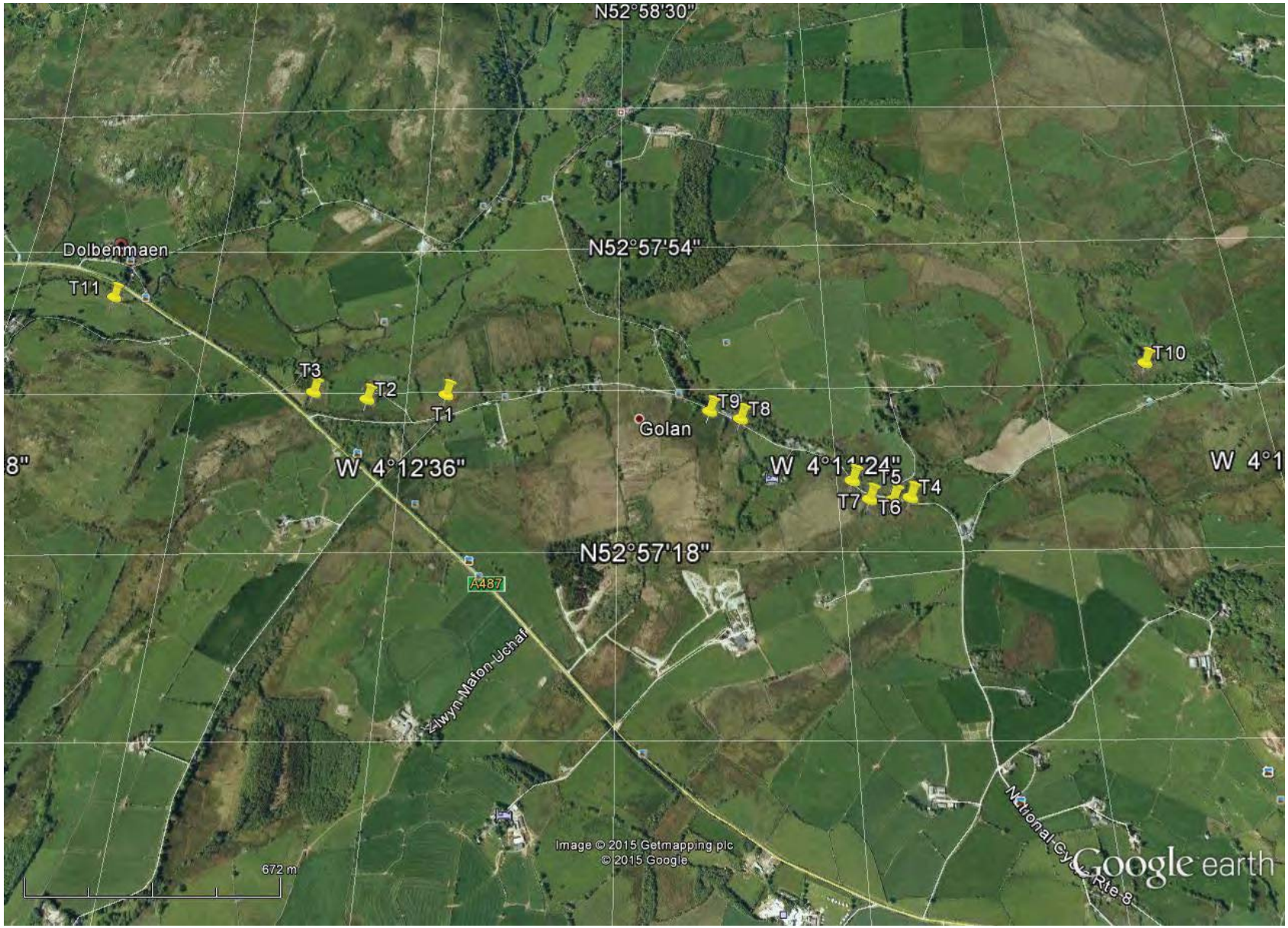
Methodology

The whole route was walked by the author and Mr John Giorgi and the ground probed using a 1.2m pointed stainless steel probe at all locations where peat deposits potentially occurred, largely recognised by the vegetation they carried and soft ground conditions. At each of these locations the stainless steel probe was pushed into the ground at several points to establish the depth of sediments. All locations where the soft sediments were established at over 0.4m depth were flagged for subsequent hand augering, all areas where the probe hit underlying stones or clays in less than 0.4m were ignored and the probing survey moved on.

After the whole route had been surveyed a total of eleven areas had been flagged for hand augering and more detailed evaluation of the soft sediments (Figs. 1). At each of these locations a series of points generally at 5 or 6m intervals (except Transect 11 on the Afon Dwyfor floodplain where auger holes were up to 100m apart) were laid across each area of peats (Fig. 2) within the pipeline easement and flagged with a red flag and subsequently hand augered and the deposits at that location recorded using standard deposit recording (Appendix 1). After hand augering and recording at each of the eleven transects a decision was made as to which transects, and which points along the transects deserved core sampling, on the basis of the sediment depth and character of the sediments. The selected sample location was flagged with a yellow flag and all hand auger points and core samples were surveyed in using a GPS by the Gwynedd Archaeological Trust (GAT) team.

Eight of the eleven transects were chosen for sampling and the deepest deposits recorded during the hand augering of each transect selected for core sampling (Figs 3-5). Core sampling was undertaken using a 110mm diameter plastic earth pipe cut down to the size appropriate for that core. The pipe was driven by hand vertically into the soft peats for the full depth recorded during the auger survey. A slot was then dug on one side of the pipe and the pipe removed with the core intact inside it. Both ends were sealed with gaffer tape and the pipe labelled. At four locations the sediments were too deep for the whole sequence to be recovered in the earth pipe.

Fig. 1. Location of each auger transect along the pipeline route marked on the Google Earth image (Copyright Google Earth).



At these locations the upper approximately one metre of deposits were recovered in an earth pipe and a Russian auger used to recover the sequence of peats and sediments below this depth.

Each 110mm core tube was cut open to expose the core within. This was cleaned, described and logged and photographed. For the cores recovered using the Russian auger, these also were cleaned, described and logged and photographed. A radiocarbon sample was taken from suitable material near the base of each of the eight organic sequences sampled in the earth pipes. These were above the base of the sequence where the Russian corer was used (Table 2). These dates define the early part of peat formation at each sampled location and give an indication of the periods covered by the organic sequences.

The radiocarbon samples were submitted to the Radiocarbon Laboratory at the Scottish Universities Environmental Research Centre (SUERC) for dating.

Fig. 2 Transect 2. Line of flags marks the exploratory auger holes.

Samples for pollen analysis were taken at 4cm intervals through each core, bagged, labelled and stored in a fridge. The cores were subsequently wrapped in cling film to seal them and have been stored until a post-excavation programme is approved. Observation of the condition of the organic deposits at the time of augering and sampling indicated that in general the preservation of pollen was likely to be excellent

although much of the peat was humified. The deposits remained waterlogged, although historic/prehistoric episodes of dessication were suggested by humified horizons in the sequences.

Fig. 3. Looking west along the line of Transect 10. The core TR10 was taken on the far side of the bog.

Radiocarbon results and probable date range

The series of radiocarbon dates summarised in Table 1 indicate that the sampled deposits include a broad range of dates during prehistory from the early Mesolithic through to the Middle Iron Age. In all cores except that from Transect 6 the non-fibrous humic acid fraction of the sampled sediment was radiocarbon dated but in Transect 6 a small fragment of roundwood was dated.

Collectively the eight sampled sequences are likely to span much of the prehistoric period from the early Mesolithic through to the later Iron Age. Since these cores recovered peats right up to the modern ground surface it is probable that significant parts of the historic period will also be represented in the upper parts of the cores. A black humified horizon is present in the upper part of cores Tr1, Tr2, Tr3 and Tr5 (see core logs below) which is likely to equate to a period of dessication and drying out of the bogs. Such a drier episode occurred in the Roman period and further radiocarbon dating would establish the date of these horizons and whether they are contemporary. It is clear from the series presented in Table 2 that the upper part of

all cores must include parts of the historic period, but the final span can only be established through further radiocarbon dating.

Results

The spike and auger survey identified a shallow covering of peats over a palaeosol across several areas of the pipeline route but only in eleven areas was this deemed to be worth augering and of these eleven areas eight were subsequently core sampled (Figs. 3-5). A palaeosol was recognised beneath the peats in several of the auger transects (T3, T6, T7, T8 and T9) but was probably present beneath the peats in the other transects although not visually recognised in the field. Peat depth varied along the route from just a few centimetres to 1.65m in BH1.5 of Transect 8.

The bulk of the augered areas were peat deposits overlying the natural diamicton (boulder clay/till- http://mapapps.bgs.ac.uk/geologyofbritain/home.html?) but Transect 11 specifically tackled the floodplain of the Afon Dwyfor and a possible palaeochannel that was suggested by a wetter area with rushes on the southern floodplain of the river. This latter area produced mainly mineral sediments and the hand augering was stopped repeatedly by stones in the sediments. No significant organic deposits were located in the six auger holes along this transect so the floodplain was not cored. The other transect where no core sample was taken was T4 where the maximum depth of peat was 0.15m.

The basic superficial deposit sequence along the route comprises an underlying diamicton (glacial till) of Devensian age with an *in situ* developed soil. In places the palaeosol may have suffered erosion and been truncated. Peats, silty peats and organic silts subsequently developed or were deposited over the sampled areas at different periods. The formation of the peats were not synchronous along the whole route and the earliest peats which developed in the early mesolithic were recorded in Transect 8 while those in Transect 3 did not develop until the middle Iron Age.

The sampled sequences are described below in transect order.

Transect 1, BH5, core (top at 100.23m OD)

0-6cm	fibrous peaty turf
16-14	dark brown (10YR 3/3) fibrous humified peat with penetrating herbaceous roots
14-41	black (10YR 2/1) completely humified peat
41-66	very dark brown (10YR 2/2) soft humified peat with penetrating roots
66-100	dark brown (7.5YR 3/2) humified peats with penetrating herb. roots
100-104	dark brown (7.5YR 3/2) fibrous humified peats
	Nose (10cm) of Russian corer in clay/stone

Pollen samples taken at 4-104cm at 4cm intervals
C14 sample at 91-92cm – 4671±26 BP (SUERC-60022)

Table 1. Radiocarbon dates obtained from each sampled core arranged in chronological order, core depth, number of pollen samples taken and height above sea level. (individual date details are presented in Appendix 2)

Core location	Borehole	Depth	C14 date	Period	Lab No.	Total depth of core cm	No. pollen samples at 4cm intervals	OD height in m.
Transect 10	BH2	85-86cm	2318 ± 29 BP	MIA	SUERC-60015	88	22 samples	139.57
Transect 3	BH2	67-68cm	2286 ± 29 BP	MIA	SUERC-60016	73.5	18 samples	98.03
Transect 6	BH3	72-73cm	2792 ± 29 BP	LBA	SUERC-60025	94	23 samples	125.82
Transect 7	BH2	47-48cm	4462 ± 29 BP	M Neo	SUERC-60017	65	15 samples	126.55
Transect 1	BH5	91-92cm	4671 ± 26 BP	E Neo	SUERC-60022	104	26 samples	100.23
Transect 2	BH3	63-64cm	4930 ± 29 BP	E Neo	SUERC-60023	100.5	25 samples	97.23
Transect 5	BH1	83-84cm	5656 ± 29 BP	L Meso	SUERC-60024	146	36 samples	127.58
Transect 8	BH1	78-79cm	8566 ± 28 BP	E Meso	SUERC-60018	165	40 samples	118.95

Table 2. Pollen samples taken and position of C14 dates (samples recommended for study highlighted)

Tr1	cal BC	Tr2	cal BC	Tr3	cal BC	Tr5	cal BC	Tr6	cal BC	Tr7	cal BC	Tr8	cal BC	Tr10	cal BC
4		4		4		4		4		4		4		4	
8		8		8		8		8		8		8		8	
12		12		12		12		12		12		12		12	
16		16		16		16		16		16		16		16	
20		20		20		20		20		20		20		20	
24		24		24		24		24		24		24		24	
28		28		28		28		28		28		28		28	
32		32		32		32		32		32		32		32	
36		36		36		36		36		36		36		36	
40		40		40		40		40		40		40		40	
44		44		44		44		44		44		44		44	
48		48		48		48		48		48	3336-3210 & 3140-3023	48		48	
52		52		52		52		52		52		52		52	
56		56		56		56		56		56		56		56	
60		60		60		60		60		60		60		60	
64		64	3771-3651	64		64		64				64		64	
68		68		68	404-353 & 292-231	68		68				68		68	
72		72		72		72		72	1013-890			72		72	
76		76				76		76				76		76	
80		80				80		80					7603-7551	80	
84		84				84	4550-4445	84				80		84	
88		88				88		88				84			415-357
92	3520-3369	92				92		92				88		88	
96		96	Date!			96						92			
100		100				100						96			
104						104						100			
						108						104			
						112						108			
						116						112			
						120						116			
						124						120			
						128						124			
						132						128			
						136						132			
						140	Date!					136			
						144						140			
												144			
												148	Date!		
												152			
												156			
												160			

Transect 2, BH3, core (top at 97.23m OD)

0-8cm	very dark brown fibrous peaty turf
8-21	very dark brown (7.5YR 2.5/2) humified slightly fibrous peat with herbaceous roots
21-23	black (7.5YR 2.5/1) completely humified peat with fibrous herb. roots
23-30	very dark brown (7.5YR 2.5/2) humified peat with occasional small mudstone
30-49	very dark brown (7.5YR 2.5/2) humified peat with herbaceous roots and occasional penetrating woody roots, slightly silty towards bas (42-48)
49-66	very dark brown (7.5YR 2.5/2) slightly fibrous humified silty peat with penetrating woody roots and herbaceous roots.
66-100.5	very dark brown (7.5YR 2.5/2) slightly fibrous humified peat with occasional small wood and penetrating herbaceous roots
	Nose (10cm) of Russian corer hit clay or stone

Pollen samples taken at 4-100.5cm at 4cm intervals
C14 sample at 63-64cm – 4930±29 BP (SUERC-60023)

Transect 3, BH2, core (top at 98.03m OD)

0-10.5cm	fibrous peaty turf
10.5-14	very dark brown (10YR 2/2) fibrous humified peat with herbaceous roots
14-20	dark reddish brown (5YR 2.5/2 humified fibrous peat with herbaceous roots
20-23	black (10YR 2/1) completely humified oxidised peat with fibrous roots
23-27	dark reddish brown (5YR 2.5/2) humified fibrous peat with roots
27-29	black and very dark brown (10YR 2/1 and 2/2) completely humified fibrous peat with roots
29-40	dark reddish brown (5YR 2.5/2) moist humified slightly fibrous peat with herbaceous roots
40-69	dark reddish brown (5YR 2.5/2) fibrous partly humified moist peat
69-73.5	dark reddish brown (5YR 2.5/2) fibrous partially humified moist peat with wood fragments

Pollen samples taken at 4-72cm at 4cm intervals
C14 sample at 67-68cm (sediment) – 2286±29 BP (SUERC-60016) and 71-72cm (wood)

Transect 5, BH1, core (top at 127.58m OD)

0-8cm	very fibrous turf layer
8-12	black (10YR 2/1) completely humified peat – dry
12-26	very dark brown (10YR 2/2) completely humified peat with a little silt and very rare sand grains, slightly fibrous, mainly roots
26-67	very dark brown (10YR 2/2) completely humified peat, with occasional wood (roots?) and root fibres
67-88	very dark brown (10YR 2/2) slightly fibrous humified peat, with penetrating herbaceous roots and occasion al wood
88-95	dark greyish brown/greyish brown (10YR 4/2 and 5/2) soft organic silt with penetrating roots
95-98	very dark brown (10YR 2/2) silty humified peat with herbaceous roots

98-104	very dark brown (10YR 2/2) slightly silty fibrous humified peat
104-109	very dark greyish brown (10YR 3/2) humified peaty silt
109-119	dark grey (10YR 4/1) slightly organic fine silt
119-124	very dark greyish brown (10YR 3/2) humified peaty silt
124-135	very dark brown (10YR 2/2) humified silty peat with occasional wood fragments
135-137	wood
137-143	very dark brown (10YR 2/2) humified slightly fibrous peat
143-146	very dark greyish brown (10YR 3/2) peaty silt
	Nose (10cm) of Russian corer hit clay/stone

Pollen samples taken at 4-144cm at intervals of 4cm
C14 sample at 83-84cm – 5656±29 BP (SUERC-60024)

Transect 6, BH3, core (top at 125.82m OD)

0-6cm	fibrous dark brown turf with occasional small smoothed stones and beetle elytra
6-18	fibrous dark brown slightly humified peat
18-32	dark brown (7.5YR 3/4) fibrous humified well preserved peat oxidising on exposure
32-44	brown (7.5YR 3/3) slightly fibrous humified well preserved peat and very occasional fragments of mudstone
44-48.5	very dark greyish brown (10YR 3/2) fibrous slightly sandy peat with small grits and some roots
48.5-61	very dark brown (10YR 2/2) humified slightly fibrous peat
61-67	very dark greyish brown (10YR 3/2) humified slightly fibrous peat with occasional roundwood and twigs, and roots
67-81	dark brown (7.5YR 3/2) humified fibrous peat with small roundwood and twigs, and roots
81-94	very dark greyish brown (10YR 3/2) organic sandy gravel with penetrating roots and occasional roundwood or roots

Pollen samples taken at 4-92cm at 4cm intervals
C14 sample take at 72-73cm – wood - 2792 ± 29 BP (SUERC-60025)

Transect 7, BH2, core (top at 126.55m OD)

0-3cm	fibrous turf
3-5	dark brown humified fibrous peat
5-13	very dark greyish brown (10YR 3/2) organic fine silt
13-33	black and very dark brown (10YR 2/1 and 2/2) very humified peat
33-48	black and very dark brown (10YR 2/1 and 2/2) very humified slightly silty peat with roots
48-52	very dark grey (10YR 3/1) slightly gritty humified peaty silt with roots
52-65	grey (10YR 6/1) clay with penetrating roots with stone (mudstone) at base

Pollen sample taken at 4 to 60cm at 4cm intervals
C14 sample at 47-48cm - 4462 ± 29 BP (SUERC-60017)

Transect 8, BH1.5, core (top at 118.95m OD)

0-2cm	rich brown fibrous turf
2-7	dark brown (7.5YR 3/2) fibrous humified peat
7-16	very dark greyish brown (10YR 3/2) humified peaty silt/silty peat
16-32	very dark greyish brown (10YR 3/2) completely humified peats with occasional wood
32-36	very dark brown (10YR 2/2) completely humified peat with traces of wood (roots?)
36-43	very dark brown (10YR 2/2) slightly silty humified peat
43-68	very dark grey (7.5YR 3/1) soft humified peat withn occasional wood (poss. roots)
68-80	black (7.5YR 2/1) soft humified peat
80-102	brown (10YR 4/2) clayey silt with penetrating roots to 2cm diameter, becoming darker with depth to very dark brown (10YR 2/2)- slightly organic silt
102-122	very dark greyish brown (10YR 3/2) organic clayey silt
122-136	very dark brown (10YR 2/2) humified organic silt.
136-148	very dark brown (10YR 2/2) humified silty peat with reed rhizomes
148-158	very dark greyish brown (10YR 3/2) organic silt
158-165	dark greyish brown (10YR 4/2) slightly organic silt
	Nose of Russian corer on clay/stone at 177cm

Pollen samples taken at 4-160cm at 4cm intervals
C14 sample at 78-79cm – 8566±28 BP (SUERC-60018)

Transect 10, BH2, core (top at 139.57m OD)

0-3cm	dark brown fibrous peaty turf
3-25	very dark greyish brown (10YR 3/2) fibrous humified peat
25-45	very dark greyish brown (10YR 3/2 patches of 3/1) fibrous humified peat – small stone at 37cm
45-88	dark brown (7.5YR 3/2) very moist fibrous humified peat, oxidising on exposure to air

Pollen samples taken at 4-88cm at 4cm intervals
C14 sample at 85-86cm - 2318 ± 29 BP (SUERC-60015)

Mesolithic

Early and late Mesolithic dates have been obtained from cores Tr8 and Tr5 respectively. Both dates were obtained from sediments halfway up the core sequences (Table 2). On this basis these two cores are likely to cover much of the Mesolithic period and the very end of the Mesolithic is likely to be represented in the basal half of the core from Tr2 which has an early Neolithic date with 40cm of sampled deposit below (Table 2).

Neolithic

Neolithic dates have been obtained from three of the cores, Tr1, Tr2 and Tr7. The early Neolithic date was obtained at 64cm in Tr2 and with 40cm of sediment below this horizon this core is likely to include the whole of the 4th millennium BC. In Tr1 and Tr7 the dates were obtained from deposits near the base of the sequence. In combination these three cores are likely to include sediments from the whole of the

Neolithic period. The Tr7 sequence is just 65cm deep and likely to be duplicated in Tr1 and with these two cores lying at 126 and 100m OD respectively it could be argued that they will duplicate each other, but Tr1 lies on the lower valley edge just above the floodplain of the Afon Dwyfor while Tr7 lies on higher plateau lands above the Afon Henwy just south east of Brynkir Woollen Mill. Both cores Tr5 and Tr8 are also likely to include Neolithic peats overlying the dated Mesolithic deposits.

Bronze Age

The only Bronze Age date obtained at this stage of the project was from near the base of the sequence from Tr6 where a late Bronze Age date was obtained (Table 2). But it is probable that cores Tr1, Tr2, Tr5 and Tr7 will include early, and possibly later, Bronze Age deposits. While this cannot be guaranteed, in combination the sequences are likely to cover a large part of the Bronze Age.

Iron Age

Two of the cores, Tr3 and Tr10 produced Iron Age radiocarbon dates from the base of their sequences (Table 2). Tr3 is located at 98m OD just above the southern edge of the floodplain of the Afon Dwyfor while Tr10 occurs at the other end of the pipeline route at 139m OD in a peat filled stream hollow (Fig. 3) below a north facing scarp above which sits the farm of Cefn-coch-isaf . Despite these being the only two cores that have so far produced an Iron Age date it is probable that several of the cores already discussed above will include peats of this period, and Tr6 is likely to include at least the early part of the Iron Age.

Historic periods

Since the initial dating programme was targetted at establishing broadly when the peats began forming in each core the absence of any dates for the historic periods indicates that all the peats investigated started developing in the prehistoric period, presumably as a result of changes in land use, climate and local hydrology. Clearly Tr5 and Tr8 represent areas that have been wet and prone to peat formation throughout the postglacial, but the remaining locations suggest episodes of localised peat formation commencing in the early Neolithic, later Bronze Age and middle Iron Age. The fact that these deposits are very local is reflected in the differences between Tr5, Tr6 and Tr7 which lie in adjacent small stream valleys across 140m of hillside (Fig. 5) and indicate sediments beginning in the Mesolithic, Neolithic and late Bronze Age.

However since every core sample was taken from the modern day surface, which in most of the cores comprises a brown peaty fibrous turf overlying peats it is probable that parts of the historic period will be represented in all the recovered cores. It would be a mistake to assume that the sequences are continuous with no hiatus'. The Roman period is often missing from peat sequences, because being drier the peat surface dried out and humified during this period creating a hiatus with no new peat growth. This can sometimes be recognised by the occurrence of 'black' humified peat (oxidised and completely humified) and such layers are certainly present in these sequences (see above) although whether of Roman date or not is not yet established.

It is perhaps unlikely that the whole of the historic period will be represented in the cores sequences but Tr3 and Tr10 are both likely to include historic deposits, and all

the cores are likely to include medieval and post-medieval peats that formed during the period of wetter conditions that began around 1300 AD (Hendon *et al* 2001), following on from the medieval warm period, and followed later by the Little Ice Age.

Discussion

Collectively the peats and sediments in this series of cores are likely to cover a big chunk of the postglacial history of this part of North Wales. There have been many pollen studies across North Wales but the bulk of these have been undertaken on upland peat bogs and mires and moorland areas (Rhind and Jones 2003) with relatively little agricultural activity other than grazing and, of course, early forest clearance. The value of this series of cores is that they all lie between 97 and 139m OD in what is quite clearly an agricultural landscape (see Fig. 1) of pastures, hayfields and even some arable. A landscape that has its origins in prehistory with burnt mounds, standing stones, prehistoric hut circles and a hillfort all lying within this part of the valley of the Afon Dwyfor, and continued in use throughout the historic period with Romano-British huts, Roman roads, medieval huts and a motte, medieval and post-medieval farmsteads and townships nearby (Richards and Smith 2013 – see Figs 4-6 for known sites within the immediate area of the pipeline route). The small and localised scale of the sampled bogs also means that they are likely to reflect the localised landscape and vegetational history with a bit more clarity than some of the large upland raised bogs.

A considerable number of aspects of the landscape history might be addressed. Evidence for early Mesolithic activity in the area based upon evidence for small scale woodland clearance and microscopic charcoal, the start of early forest clearance in this landscape, the beginnings of arable activity, periods of pastoral expansion, changes and developments in land use, the impact of climate change, the date of episodes of drying out and possible agricultural expansion, arrival of crops like cannabis and rye, early post-medieval plantations, etc. Their study would give a landscape context for the known archaeology of the area and for those archaeological discoveries made during the course of the archaeological work along the pipeline during its construction. With three sites near the floodplain of the Afon Dwyfor, four more on the plateau lands above the Afon Henwy, and one a little further up the valley towards the edge of the foothills of Snowdonia there is also the possibility of discerning any localised patterns of land use that might occur as the sites move upstream into slightly more marginal areas for agriculture.

Finally the construction of the pipeline itself may have a negative impact upon the surviving deposits in these small bogs. The pipeline trench and its fill can act as a conduit for subterranean water and effectively lead to a draining of the peats over time with the resultant oxidation and dessication of the deposits thereby destroying the palaeoenvironmental record that they contain. While the severity of such an impact and its timescale is unknown, and probably variable, for each sampled bog the small size of the sampled locations makes this potential impact more severe than would be the case for a large bog or mire.

Recommendations

The primary objective of this programme of auger survey and core sampling was to recover deposit sequences, primarily peats, that would allow a reconstruction of the vegetational history of the valley through the analysis of pollen and radiocarbon

dating. Where the cores were recovered in the 110mm diameter earth pipe there is some potential for the analysis of the plant and insect macrofossils, but since this is most likely to reflect the bog environment in which the peats formed with only minimal input from the broader landscape these approaches are considered to be less important. Where the lower part of the sequences were recovered using the Russian corer the sample size is insufficient for any useful macrofossil studies. Loss on ignition studies of the organic deposits can be undertaken to more closely define the deposit character and establish the mineral input.

The preliminary dating has established that the sampled sequences represent much of the post-glacial period and all the cores could contribute to the original objectives of the project. It is however evident from Fig 2 that the upper parts of many if not all the cores may well cover the same historical periods and it would be inappropriate to duplicate this aspect of the work across all eight cores. It is also probable that the sequence represented in Tr7, the shortest of the sampled sequences is duplicated in the nearby core TR5 (Fig. 4) and cores Tr1 and Tr2 further down the valley.

The following analyses are therefore recommended to establish a vegetational history for the local area, establish the impact of man on this vegetation, and give a palaeoenvironmental context for the local archaeology.

The whole sequence in Tr1, Tr2, Tr5 and Tr8 should be studied for pollen and additionally all samples below 20cm in Tr3, Tr6 and Tr10. Selected 10cm core units from Tr1, Tr3, Tr5 and Tr6 should be processed and studied for macrofossil remains. The base of the sequences in Tr2, Tr5 and Tr8 should be radiocarbon dated and samples from the upper part of each core sequence studied should be dated on the basis of the pollen results to give a chronology for the vegetational changes recognised that can then be tied into to the local archaeological evidence. Dating of the top of selected black humified horizons and the less humified peats immediately above will establish the possible existence and duration of any hiatus in the sequences which might reflect a drier period during which agricultural expansion could occur.

These analyses should be used to establish the local and regional vegetational and landscape history of the area, and the human impact on it, and correlate this with the known archaeology and that most recently found during the fieldwork along the water pipeline.

Acknowledgements
I should like to thank John Giorgi for his assistance during the field walkover, auger survey and coring programme. Members of the GAT field team kindly assisted during the survey and specifically surveyed all the auger holes and core locations. Members of the construction team also facilitated the programme of field work. The radiocarbon dates were carried out by the Radiocarbon Laboratory at the Scottish Universities Environmental Research Centre.

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Fig. 4. Location of cores Tr1, Tr2 and Tr3. (map taken from Richards and Smith 2013)

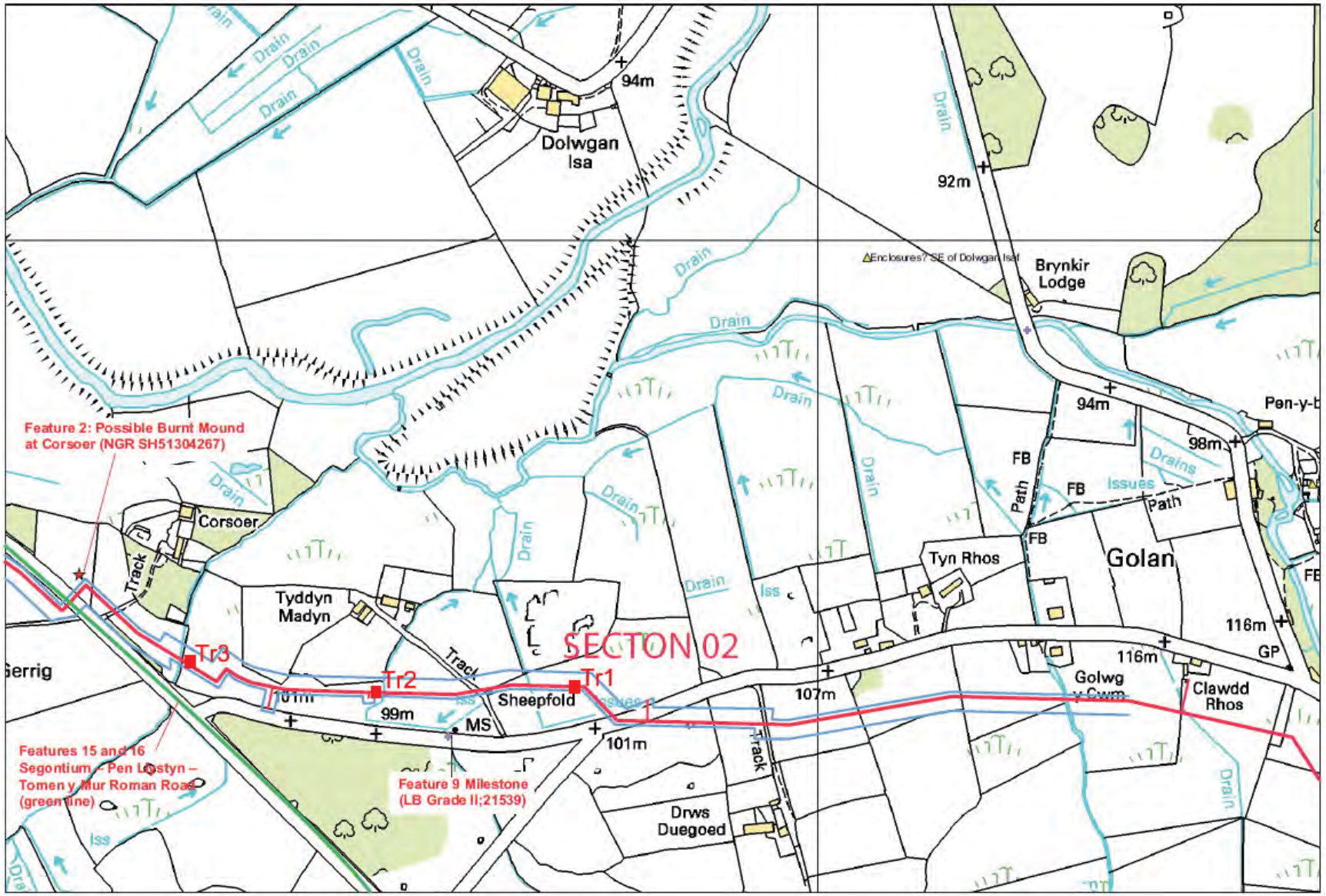


Fig. 5. Location of cores Tr5, Tr6, Tr7 and Tr8**.** (map taken from Richards and Smith 2013)

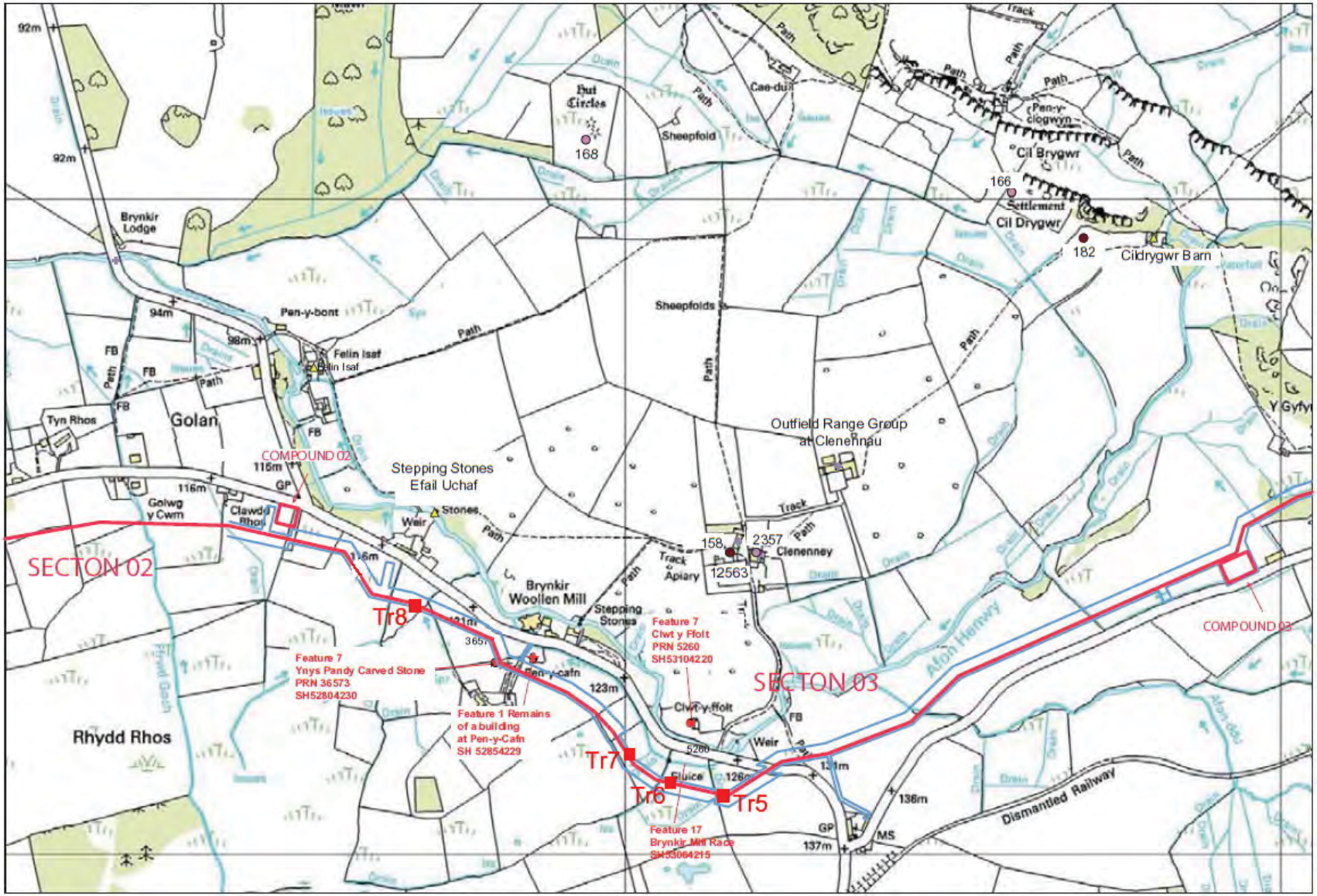
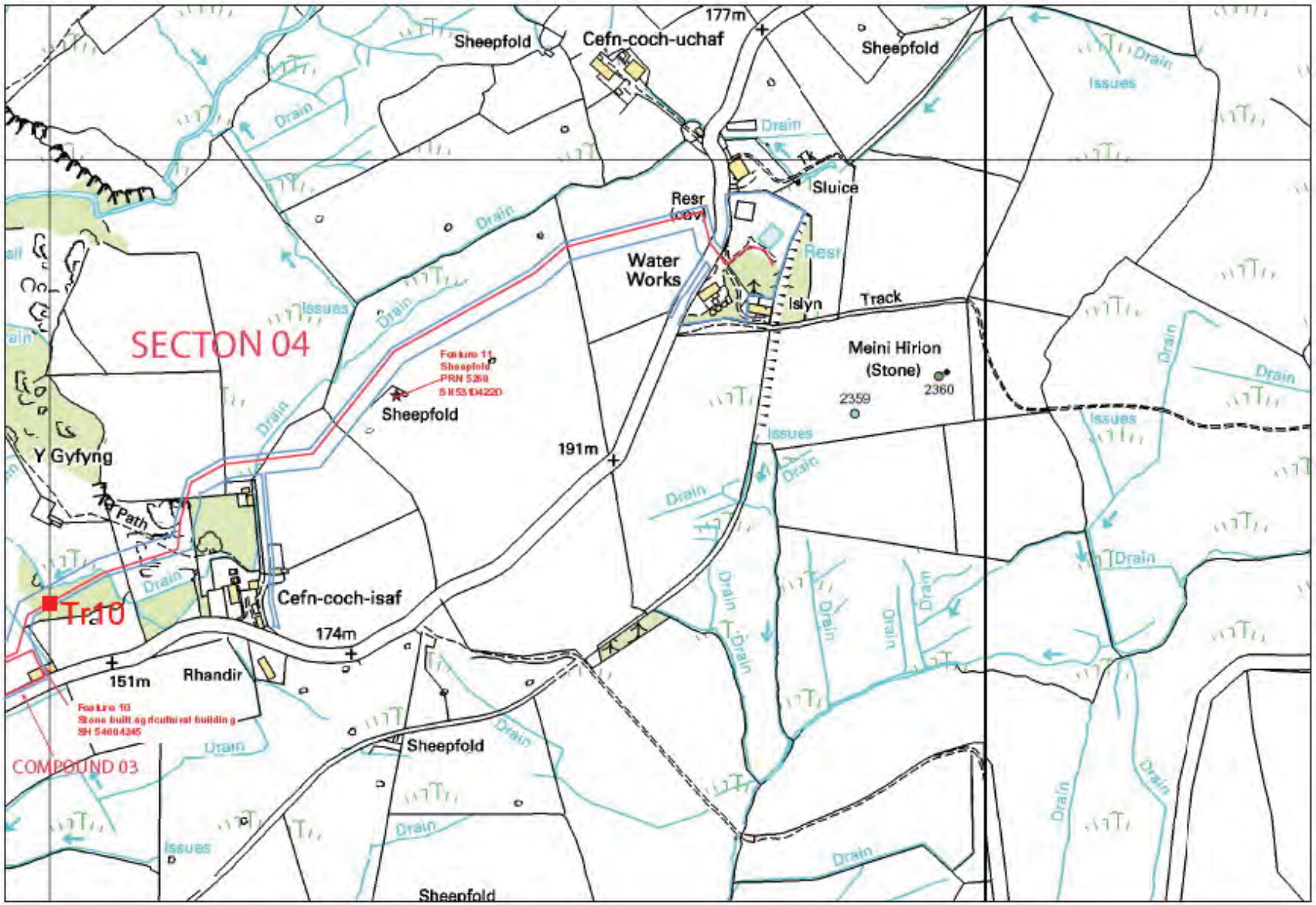


Fig. 6. Location of core Tr10**.** (map taken from Richards and Smith 2013)



Appendix 1 - Auger survey borehole logs

Transect Line 1

BH1 east end (GR 251779.494 342524.669 - 100.153 OD)

0-10cm	wet turf
10-33	brown (10YR 4/3) fine silt
33-55	brown (10YR 4/3) fine silt with iron mottling
55-70	fell out – no peats

BH2 (GR 251767.06 342524.685 – 100.288 OD)

0-9cm	fibrous mossy turf
9-20	dark brown fibrous peat
20-41	very dark brown humified fibrous peat
41-68	humified slightly silty peat with wood at 60cm
68-73	very dark brown completely humified peat-sharp boundary below
73-100	grey (10YR 5/1) fine silty clay with occasional small stones

BH3 (GR 251760.794 342524.644 – 100.261 OD)

0-6cm	fibrous mossy turf
6-14	dark brown fibrous peat
14-44	very dark brown fibrous humified peat
44-71	very dark brown well humified slightly fibrous peat
71-80	very dark grey (10YR 3/1) organic silt
80-100	silty clay with occasional pebbles – sharp boundary below

BH4 (GR 251754.725 342524.724 – 100.292 OD)

0-10cm	fibrous mossy turf
10-20	dark brown fibrous peat
20-78	very dark brown slightly fibrous humified peat
78-100	slightly wet, slightly fibrous dark brown peat
100-118	grey silty clay

BH5 (GR 251748.119 342524.249 – 100.226 OD)

0-10cm	fibrous mossy turf
10-18	dark brown fibrous peat
18-52	very dark brown humified peat
52-83	dark brown wet fibrous peat
83-115	very dark brown humified peat
115-130	dark brown wet fibrous peat – stopped by stones at 130cm

BH6 (GR 251742.687 342524.939 – 100.117 OD)

0-10cm	dark brown fibrous mossy peaty turf
10-50	very dark brown slightly fibrous humified peat
50-100	dark brown fibrous peat - stopped by stones at 104cm in 3 holes

BH7 (GR 251736.431 342524.878 – 99.989 OD)

0-13cm	dark brown fibrous mossy turf
13-36	very dark brown humified peat
36-91	dark brown wet fibrous peat
91-100	very dark brown humified peat
100-125	very dark brown humified peats onto silty peat at base (115-125cm) Stopped by stones at 125cm

BH8 (GR 251730.616 342524.755 – 99.753 OD)

0-65cm	lost but stopped by stones at 65cm

Transect Line 2

B H1 East end (GR 251527.185 342517.83 – 96.322 OD)

0-15cm	damp fibrous brown peaty turf
15-35	silty humified peat
35-38	dark brown silty non-fibrous peat
38-50	light blue grey stoney clay

BH2 (GR 251522.614 342517.996 – 96.943 OD)

0-20cm	fibrous peaty turf
20-35	black humified fibrous peat (oxidised)
35-77	dark brown fibrous peat
77-90	very dark brown humified peat
90-100	brown slightly organic silt – stopped by stones at 100cm

BH3 (GR 251516.991 342518.226 – 97.228 OD)

0-10cm	fibrous peaty turf
10-30	dark brown fibrous peat – stone at 22cm
30-110	damp dark brown fairly fibrous peat
110-120	lost (fell out)
	Stopped by stones at 120cm

BH4 (GR 251511.391 342518.233 – 97.641 OD)

0-65cm	core lost – stopped by stones at 65cm

BH5

0-15cm	fibrous peaty turf
15-20	soil horizon
20-45	slightly stoney clays

Transect Line 3

BH1 East end (GR 251342.059 342551.409 – 98.094 OD)

0-12cm	fibrous peaty turf
12-21	dark brown fibrous peat
21-32	black oxidised fibrous peat
32-46	slightly humified brown fibrous peat
46-79	soft wet dark brown fibrous peat
	Stopped by stones at 79cm

BH2 (GR 251337.555 342554.671 – 98.033 OD)

0-15cm	fibrous peaty turf
15-23	brown fibrous peat
23-35	dark brown slightly humified fibrous peat
35-85	damp fibrous brown peat
	Stopped by stones at 85cm

BH3 (GR 251332.414 342557.881 – 97.995 OD)

0-8cm	fibrous peaty turf
8-13cm	brown fibrous peat
13-17	very dark brown oxidised fibrous peat
17-35	dark brown damp fibrous peat
35-50	light brown silt – old soil?
50-56	slightly darker brown organic silt
56-60	grey clay

Transect Line 4
Field south of road crossing

BH1 North east end (road end) (GR 253191.57 342104.568 – 128.22 OD)

0-10cm	empty – compression
10-15	fibrous peaty silt
15-50	humified organic silts
	Stopped by stones at 50cms

BH2	(GR 253187.024 342102.028 – 128.312 OD)
0-14cm	organic silty turf
14-20	dark brown (10YR 3/3) humified peat
20-29	black humified silty peat
29-48	very dark greyish brown (I10YR 3/2) humified slightly organic silts

BH3	(GR 253183.268 342100.048 – 128.367 OD)
0-5cm	empty
5-18	very dark greyish brown (10YR 3/2) organic silt with occasional stone
18-30	very dark greyish brown (10YR 3/3) fine silt with a .little sand and grits
30-40	slightly stoney silty clay – natural

Transect Line 5

BH1 East end (GR 253130.888 342095.349 – 127.579 OD)

0-11cm	dark brown fibrous peaty turf
11-19	fibrous organic silt
19-39	dark brown fibrous slightly silty humified peat
39-80	dark brown damp fibrous humified peat
80-98	dark brown humified soft peat
98-137	very dark brown humified slightly fibrous peat
137-148	very dark brown humified slightly fibrous peat with wood fragments
	stopped by stones at 148cm

BH2	(GR 253126.79 342096.361 – 127.522 OD)
0-18cm	wet loose fibrous peaty turf
18-25	organic silt
25-45	dark brown humified fibrous peat
45-58	very dark brown peat with wood fragments
58-90	very dark brown compacted slightly fibrous peat
90-109	very dark brown compacted fibrous peat with occasional wood fragments
109-126	dark grey (10YR 4/1) organic silt with wood fragments
	Stopped by stones at 130cm

BH3	(GR 253122.643 342097.262 – 127.529 OD)
0-15cm	empty- compression
15-30	wet brown fibrous silty peat
30-43	dark brown fibrous humified peat
43-44	grey silt band
44-50	dark brown fibrous peat
50-60	grey fibrous silty layer
60-61	dark brown fibrous peat
61-80	lost- fell out
	Stopped by stones at 80cm

Transect line 6 (east of stream/drain line)

BH1	(GR 253073.055 342108.254 – 126.246 OD)
0-8cm	empty – compression
8-18	dark brown fibrous peaty turf
18-37	dark brown fibrous humified slightly silty peat
37-39	gritty sandy silt
39-58	small stones and sandy organic silt – soil?
	Stopped by stones at 58cm

BH2	(GR 253067.869 342109.645 – 125.89 OD)
0-4cm	empty
4-16	very fibrous peaty turf
16-23	brown fibrous peat
23-28	dark brown fibrous peat
28-32	brown fibrous peat
32-60	dark brown fibrous humified peat with wood fragments
60-73	lost- fell out
	Stopped by stones at 73cm

BH3	(GR 253063.01 342111.211 – 125.822 OD)
0-30cm	wet fibrous peaty turf
30-80	dark brown fibrous peat
80-100	slipped out

Transect Line 7 (west of stream)

BH1	(GR 253009.467 342148.656 – 126.674 OD)
0-12cm	very dark brown humified silt
12-20	black humified silty peat
20-50	somewhat mixed slightly gritty silt - subsoil?
50-100	brownish yellow (10YR 6/6) silty clay – diamicton

BH2	(GR 253007.34 342153.173 – 126.549 OD)
0-13cm	fibrous silty turf
13-36	black wet humified loose peat
36-53	very dark grey (10YR 3/1) organic silt – palaeosol?
53-65	light grey (10YR 7/1) leached silty clay – palaeosol

Two more holes were sunk to the west but produced no more than BH1 and BH2 and were not recorded

Transect 8 – west of woollen mill

BH1 - East end (GR 252686.589 342382.555 – 118.955 OD)

0-30cm	dark grey (10YR 4/1) humified organic silt – topsoil
30-36	very dark grey organic silt with roots
36-52	dark greyish brown (10YR 4/2) humified organic silt
52-100	very dark brown slightly silty humified peat with occasional wood fragments
100-166	humified peat with occasion al wood fragments (roots?)
166-178	dark greyish brown (10YR 4/2) fine humified organic silt – palaeosol
178-185	grey clay

BH2 (GR 252682.711 342384.129 – 118.923 OD)

0-20cm	dark grey (10YR 4/1) silt loam
20-33	very dark greyish brown (10YR 3/2) very organic silt
33-65	damp brown fibrous humified peat with wood – blacker in top 5cm
65-86	very dark brown humified fibrous peat – oxidised in past
86-105	dark greyish brown (10YR 4/2) fine organic silts
105-157	dark brown humified peat with occasional wood
157-169	dark greyish brown (10YR 4/2) humified organic silt – palaeosol
169-185	grey clay

BH3 (GR 252677.951 342386.415 – 118.867 OD)

0-18cm	dark grey silt loam
18-35	damp brown humified fibrous peat
35-41	black humified peat
41-70	red brown humified fibrous peat with wood fragments
70-85	dark brown humified peat with wood fragments (roots?)
85-106	dark greyish brown (10YR 4/2) humified organic silt
106-115	dark greyish brown (10YR 4/2) silt – palaeosol
	Stopped by stone at 115cm

BH4 (GR 252673.092 342388.198 – 118.811 OD)

0-22cm	dark grey silt loam
22-44	dark brown humified fibrous peat
44-50	dark greyish brown (10YR 4/2) silt – palaeosol
	Stopped by stones at 50cm

Transect Line 9 – west of Transect 8

BH1 - east end (GR 252598.539 342421.769 – 119.23 OD)

0-23cm	silt loam – fibrous topsoil
23-28	black humified peat
28-36	brown fibrous peat
36-44	dark greyish brown (10YR 4/2) silt – palaeosol
44-46	grey clay

BH2 not logged – disturbed, 44cm deep (GR 252595.882 342425.827 – 119.137 OD)
BH3 not logged – same as BH1, 46cm deep (GR252593.077 342430.516 – 119.128 OD)
BH4 not logged – same as BH1, clay at 36cm (GR252590.558 342434.353 – 119.142 OD)

Transect Line 10

BH1 East end (GR 254020.419 342539.945 – 140.188 OD)

0-12cm	fibrous peaty turf
12-60	fibrous slightly humified peat
60-70	lost- fell out – stones at 70cm

BH2 (GR 254013.449 342535.894 – 140.067 OD)

0-10cm	fibrous peaty turf
10-35	dark brown fibrous humified peat
35-52	very dark brown humified fibrous peat
52-100	dark brown humified fibrous peat
100-105	lost – fell out
	Stopped by stones at 105cm

BH3 (GR 254009.03 342533.615 – 139.701 OD)

0-10cm	fibrous peaty turf
10-60	brown fibrous peat
60-90	fibrous organic silt
	Stopped by stones at 90cm

BH4 (GR 254002.843 342530.015 – 139.56 OD)

0-10cm	fibrous peaty turf
10-40	brown fibrous humified peat
40-55	darker brown fibrous peat
55-95	brown fibrous peat
	Stopped by stones at 95cm

BH5 (GR 253998.641 342527.529 – 139.573 OD)

0-10cm	fibrous peaty turf
10-35	brown slightly humified fibrous peat
35-51	darker brown humified fibrous peat
51-100	wet brown fibrous peat
	Stopped by stones at 100cm

BH6 (GR 253993.907 342524.471 – 139.477 OD)

0-10cm	fibrous peaty turf
10-30	brown fibrous peat
30-48	darker brown fibrous peat
48-100	fibrous brown peat
	Stopped by stones at 101cm

Transect line 11

BH1 East end (first low rushy hollow) (GR 250829.351 342858.484 – 88.364 OD)

0-15cm	fine clayey silt – alluvial soil
15-27	dark grey humified organic silt – old soil/marshy turf
27-50	slightly stoney (small clasts) silty clay
50-55	grey stoney clay

BH2 (GR 250736.176 342896.639 – 88.011 OD)

0-17cm	brown (10YR 5/3) silty clay loam
17-35	dark greyish brown (10YR 4/2) silty clay
35-70	brown (10YR 5/3) soft silt
70-100	greyish brown (10YR 5/2) sandy silt with occasional degraded organic traces and sandier bands
100-106	brown slightly organic fine silt
106-118	grey slatey sand and fine gravel

BH3 (GR 250650.891 342930.659 – 88.403 OD)

0-25cm	yellowish brown (10YR 5/4) silt with occasional small rounded pebbles
25-46	dark yellowish brown (10YR 4/4) fine silt with some iron deposition
46-54	brown (10YR 4/3) small slatey pebbles in a clay matrix
54-60	slatey gravel in silty clay matrix
	Stopped by stones at 60cm

BH4 (GR 250589.719 342957.752 – 88.183 OD)

0-16cm	gritty silts – probably dumping!
16-27	old turf – recent
27-48	brown (10YR 4/3) silt with occasion al grits
48-85	brown fine waterlain slightly organic silts – poss. channel fills
85-107	silts and slatey gravel with organic traces and rootlets and organic silts
107-115	slatey gravel in a silt matrix with some degraded organics
115-126	slatey gravel with a silt matrix

BH5 (GR 250558.39 342967.923 – 88.141 OD)

0-10cm	brown (10YR 4/3) silts
10-20	brown (1oYR 4/3) fine silts
20-48	pale brown (10YR 6/3) clayey silt with occasional small pebbles – alluvium?
48-55	gravelly silty clay
55-90	sandy gravels

BH6 (GR 250492.962 342993.933 – 88.024 OD)

0-25cm	fine silts – alluvium
25-40	slightly gritty silts – alluvium
40-60	gravelly silts – stones to 20mm
	Stopped by stones at 60cm

Appendix 2. Radiocarbon dates from each of the sampled cores.

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RADIOCARBON DATING CERTIFICATE

07 May 2015

Laboratory Code	SUERC-60015 (GU37322)
Submitter	James Rackham Environmental Archaeology Consultancy 25 Main Street South Rauceby, Sleaford Lincolnshire NG34 8QG
Site Reference	Dolbenmaen pipeline, North Wales
Context Reference	non fibrous fraction
Sample Reference	Tr10/BH2/85-86cm
Material	Humified peat : Humic Acid Dated
$\delta^{13}C$ relative to VPDB	-29.3 ‰
Radiocarbon Age BP	2318 ± 29

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

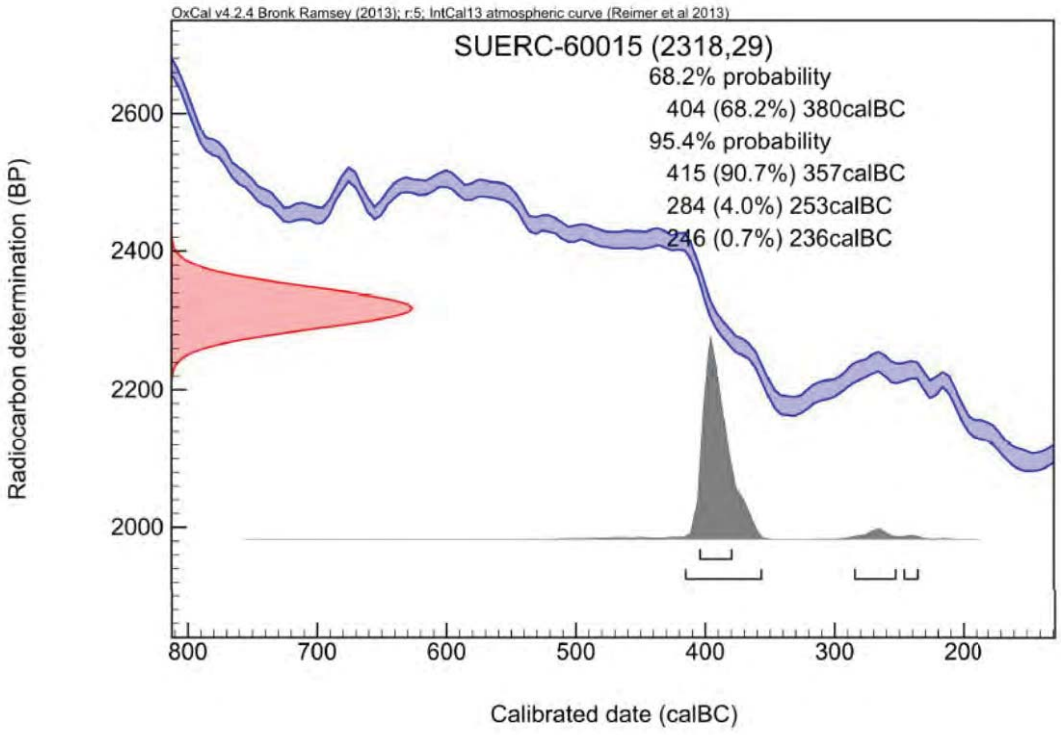
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E Dunbar Date :- 07/05/2015

Checked and signed off by :- P. Naysmith Date :- 07/05/2015

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

07 May 2015

Laboratory Code	SUERC-60016 (GU37323)
Submitter	James Rackham Environmental Archaeology Consultancy 25 Main Street South Rauceby, Sleaford Lincolnshire NG34 8QG
Site Reference	Dolbenmaen pipeline, North Wales
Context Reference	non-fibrous fraction please
Sample Reference	Tr3/BH2/67-68cm
Material	Humified peat : Humic Acid Dated
$\delta^{13}C$ relative to VPDB	-29.3 ‰
Radiocarbon Age BP	2286 ± 29

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

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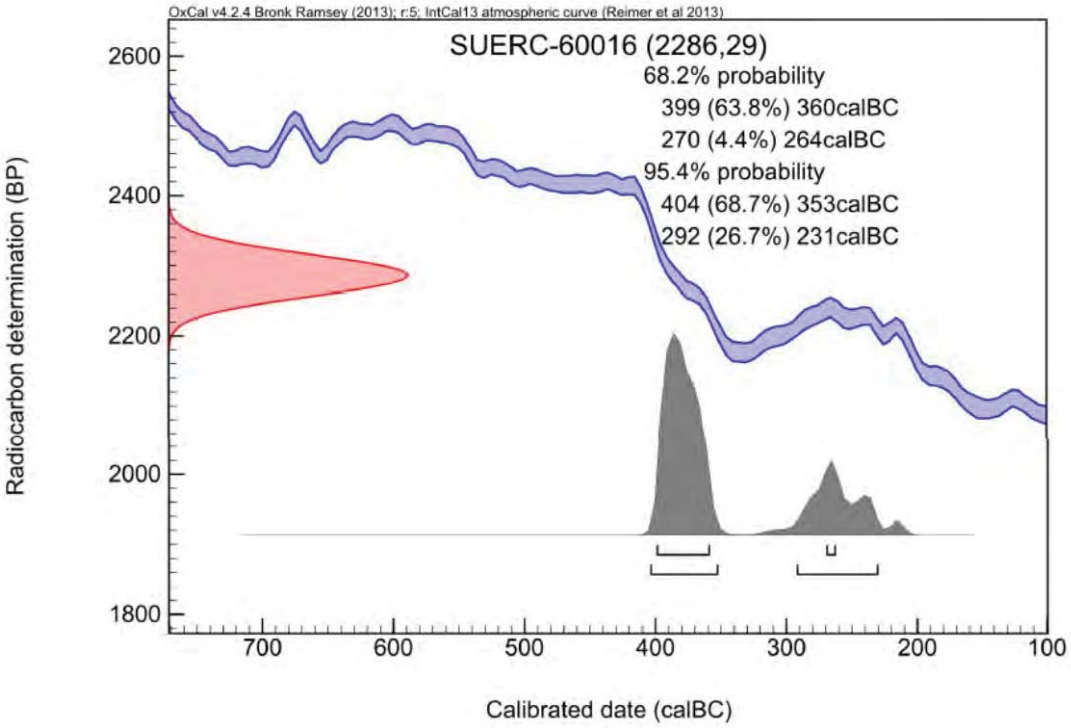
Conventional age and calibration age ranges calculated by :- E Dunbar Date :- 07/05/2015

Checked and signed off by :- P. Naysmith Date :- 07/05/2015

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

07 May 2015

Laboratory Code	SUERC-60017 (GU37324)
Submitter	James Rackham Environmental Archaeology Consultancy 25 Main Street South Rauceby, Sleaford Lincolnshire NG34 8QG
Site Reference	Dolbenmaen pipeline, North Wales
Context Reference	non-fibrous fraction
Sample Reference	Tr7/BH2/47-48cm
Material	Humified peat : Humic Acid Dated
$\delta^{13}C$ relative to VPDB	-29.4 ‰
Radiocarbon Age BP	4462 ± 29

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

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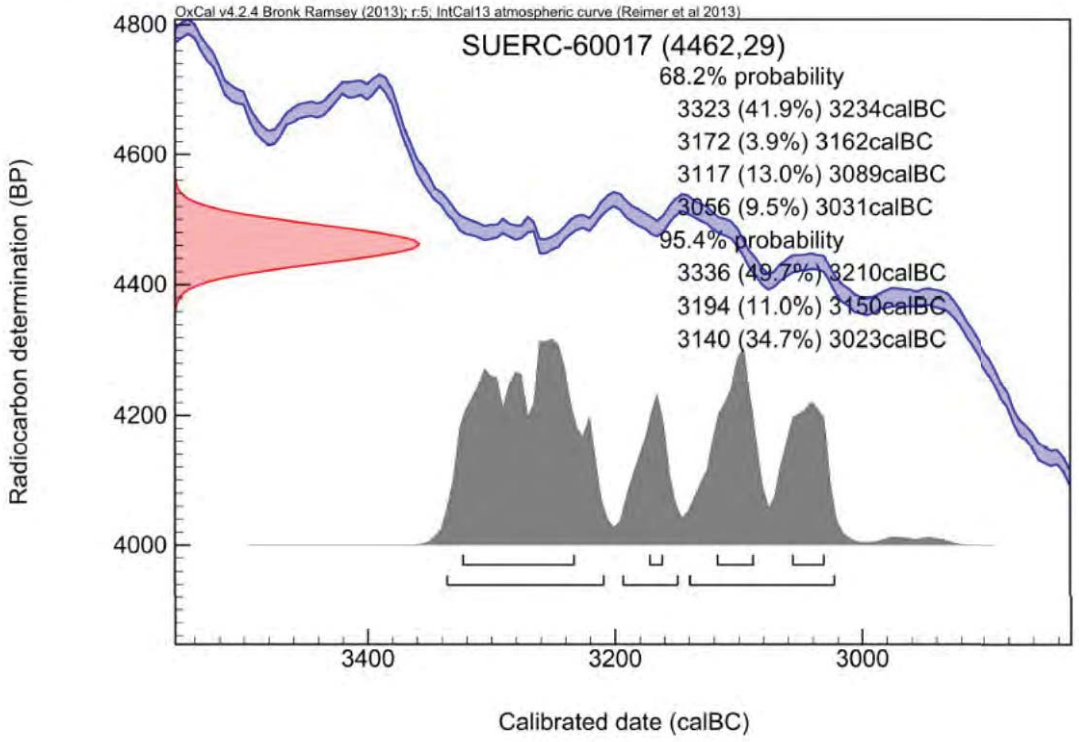
Calibration Plot



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RADIOCARBON DATING CERTIFICATE

07 May 2015

Laboratory Code	SUERC-60018 (GU37325)
Submitter	James Rackham Environmental Archaeology Consultancy 25 Main Street South Rauceby, Sleaford Lincolnshire NG34 8QG
Site Reference	Dolbenmaen pipeline, North Wales
Context Reference	non-fibrous fraction
Sample Reference	Tr8/BH1.5/78-79cm
Material	Humified peat : Humic Acid Dated
$\delta^{13}C$ relative to VPDB	-29.3 ‰
Radiocarbon Age BP	8566 ± 28

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

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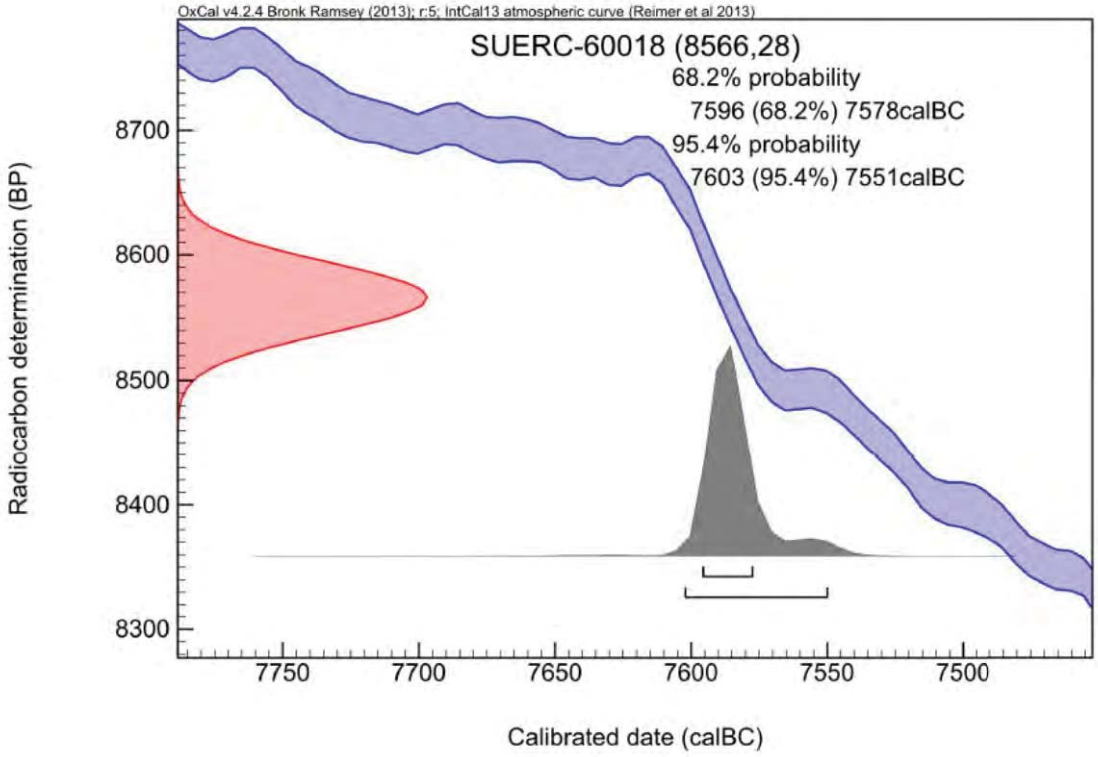
Checked and signed off by :- P. Naysmith Date :- 07/05/2015

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

07 May 2015

Laboratory Code	SUERC-60022 (GU37326)
Submitter	James Rackham Environmental Archaeology Consultancy 25 Main Street South Rauceby, Sleaford Lincolnshire NG34 8QG
Site Reference	Dolbenmaen pipeline, North Wales
Context Reference	non-fibrous fraction
Sample Reference	Tr1/BH5/91-92cm
Material	Humified peat : Humic Acid Dated
$\delta^{13}C$ relative to VPDB	-28.9 ‰
Radiocarbon Age BP	4671 ± 26

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

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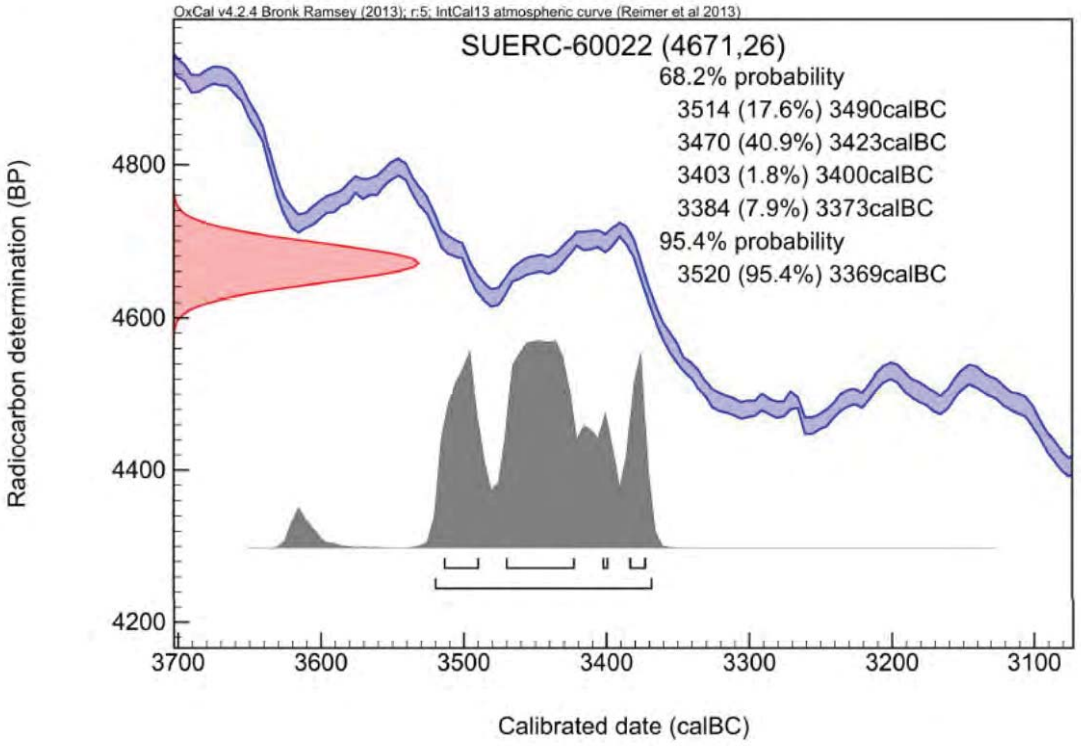
Calibration Plot



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RADIOCARBON DATING CERTIFICATE

07 May 2015

Laboratory Code	SUERC-60023 (GU37327)
Submitter	James Rackham Environmental Archaeology Consultancy 25 Main Street South Rauceby, Sleaford Lincolnshire NG34 8QG
Site Reference	Dolbenmaen pipeline, North Wales
Context Reference	non-fibrous fraction
Sample Reference	Tr2/BH3/63-64cm
Material	Humified peat : Humic Acid Dated
$\delta^{13}C$ relative to VPDB	-29.5 ‰
Radiocarbon Age BP	4930 ± 29

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

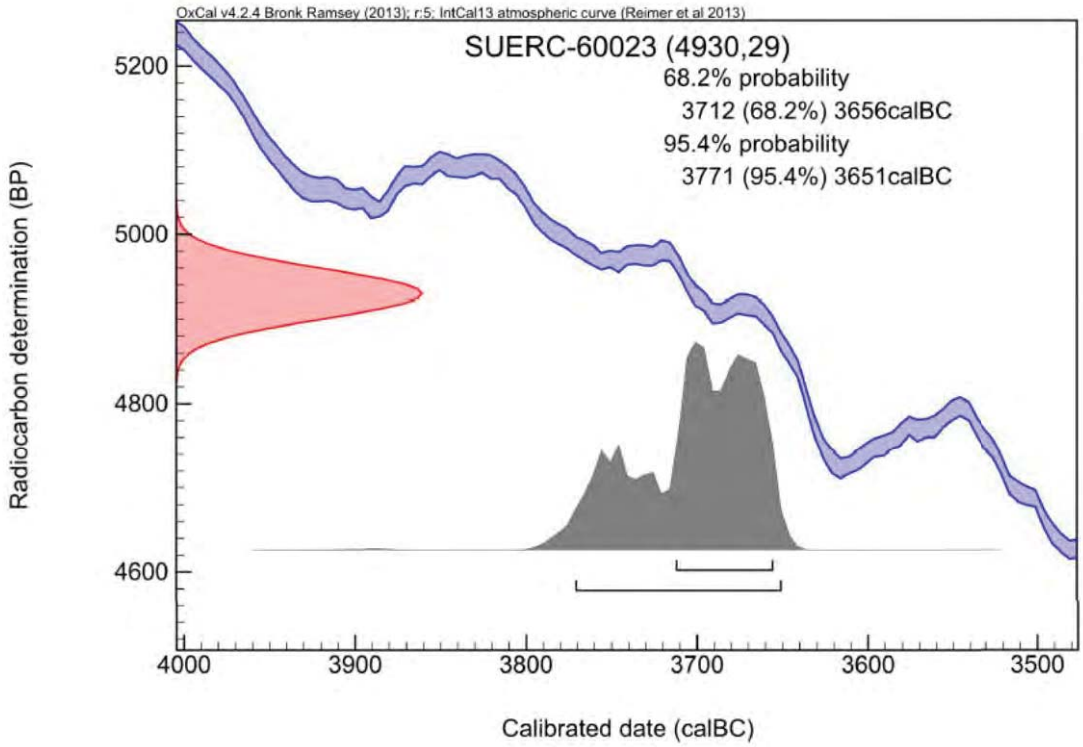
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E. Dunbar Date :- 07/05/2015

Checked and signed off by :- P. Naysmith Date :- 07/05/2015

Calibration Plot



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RADIOCARBON DATING CERTIFICATE

07 May 2015

Laboratory Code	SUERC-60024 (GU37328)
Submitter	James Rackham Environmental Archaeology Consultancy 25 Main Street South Rauceby, Sleaford Lincolnshire NG34 8QG
Site Reference	Dolbenmaen pipeline, North Wales
Context Reference	non-fibrous fraction
Sample Reference	Tr5/BH1/83-84cm
Material	Humified peat : Humic Acid Dated
$\delta^{13}C$ relative to VPDB	-29.2 ‰
Radiocarbon Age BP	5656 ± 29

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

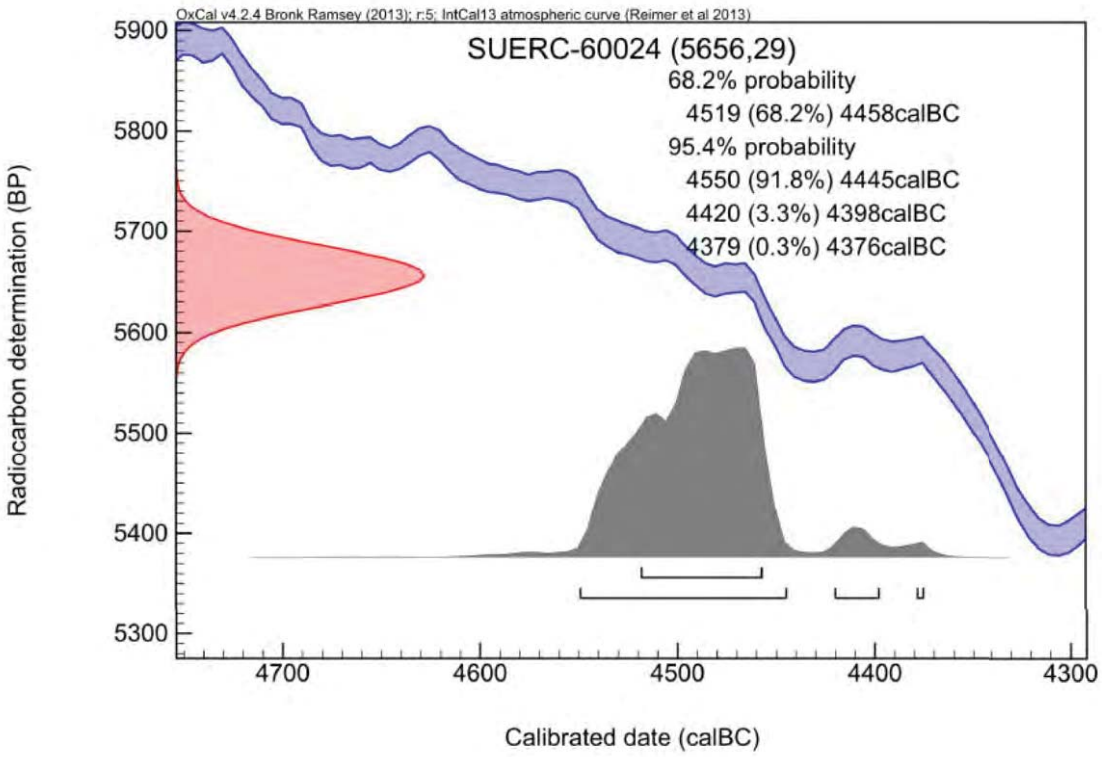
The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E Dunbar Date :- 07/05/2015

Checked and signed off by :- P. Naysmith Date :- 07/05/2015

Calibration Plot



Scottish Universities Environmental Research Centre
Director: Professor R M Ellam
Rankine Avenue, Scottish Enterprise Technology Park,
East Kilbride, Glasgow G75 0QF, Scotland, UK
Tel: +44 (0)1355 223332 Fax: +44 (0)1355 229898 www.glasgow.ac.uk/suerc

RADIOCARBON DATING CERTIFICATE

07 May 2015

Laboratory Code	SUERC-60025 (GU37329)
Submitter	James Rackham Environmental Archaeology Consultancy 25 Main Street South Rauceby, Sleaford Lincolnshire NG34 8QG
Site Reference	Dolbenmaen pipeline, North Wales
Sample Reference	Tr6/BH3/72-73
Material	wood, small roundwood : in progress
$\delta^{13}C$ relative to VPDB	-30.4 ‰
Radiocarbon Age BP	2792 ± 29

N.B. The above ^{14}C age is quoted in conventional years BP (before 1950 AD). The error, which is expressed at the one sigma level of confidence, includes components from the counting statistics on the sample, modern reference standard and blank and the random machine error.

The calibrated age ranges are determined from the University of Oxford Radiocarbon Accelerator Unit calibration program (OxCal4).

Samples with a SUERC coding are measured at the Scottish Universities Environmental Research Centre AMS Facility and should be quoted as such in any reports within the scientific literature. Any questions directed to the Radiocarbon Laboratory should also quote the GU coding given in parentheses after the SUERC code. The contact details for the laboratory are email Gordon.Cook@glasgow.ac.uk or telephone 01355 270136 direct line.

Conventional age and calibration age ranges calculated by :- E. Dunbar Date :- 07/05/2015

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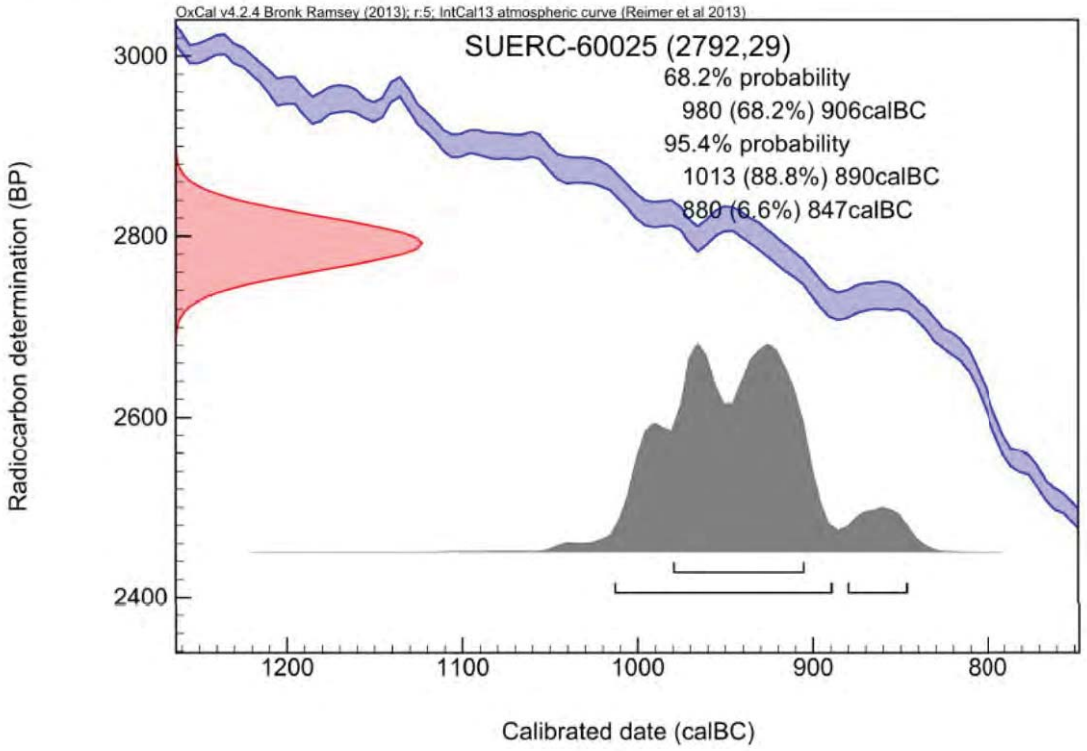
Calibration Plot



APPENDIX VII: LITHIC REPORT

By George Smith, Freelance Specialist

Methodology

Objects studied by 10X hand lens. Measurements in mm, Length (maximum perpendicular to platform) and Breadth (maximum perpendicular to length) x Depth (maximum). Dimensions of broken object ie not original, shown in brackets.

Results

Small Find #01: Topsoil within ET18.

Complete tertiary flake. Cherty flint, mottled mid-grey/light grey. 48 x 26 x 6.

Broad, thick flake. Plain platform with prominent bulb, probable light hammer struck. Some subsequent edge damage. Irregular denticulate retouch on one long side edge which has some probable utilisation polish on raised ridges between retouch scars suggesting use in cutting some soft but resilient material.

Not diagnostic of period but perhaps 2nd millennium rather than earlier.

Small Find #02: Subsoil within ET01.

Secondary flake fragment. Small and irregular. Fine flint, shattered by burning. A small amount of probable pebble cortex. Dark red colour probably as a result of alteration by burning. (20) x (16) x (6).

Not diagnostic of any function or period.

Small Find #04: Topsoil within Field 9.

Thick secondary flake. Light grey flint with pebble cortex. 53 x 24 x 9.

A concave, core-trimming flake. There is no bulb and the flake has possibly been removed from a pebble by the anvil technique. Some slight edge damage.

There is a narrow band of possible utilisation polish on one long sharp convex side edge.

Not diagnostic of any function or period.

Small Find #06: Topsoil within Field 27.

Thick, broad tertiary flake butt fragment. Light grey fine flint. (22) x (22) x 6.

Irregular platform with a prominent bulb, indicating light hammer struck.

Not diagnostic of any function or period.

Small Find #09: Topsoil within Field 51.

Plano-convex knife variant? Short, broad, thick tertiary flake. Dark grey fine flint. 34 x 25 x 6

Very prominent bulb with irregular platform and previous scalar thinning flake showing poor quality of technique. Two sides trimmed by steep edge retouch to a broad point, shaped also by a small amount of inverse retouch. One corner has been removed by ?trample damage.

If it is a variant plano-convex knife this indicates a 2nd millennium date but it is all rather odd and has an all-over polish that suggests much handling such as from being carried in a pouch or pocket. However, worth illustration if to be published.

Small Find #10: Subsoil within Field 1.

Small end scraper on a blade. Yellow-brown fine flint. 32 x 19 x 5.

A thin tertiary flake neatly abruptly retouched at the tip to a convex scraper edge. There is also some lateral trimming.

End scrapers on blades are typically Mesolithic but not entirely so and this is small and not typical but a Later Mesolithic/Early Neolithic date seems likely.

Small Find #11: Topsoil within Field 5.

A complete, broad, thick, secondary core-trimming flake. Mid-grey, slightly cherty flint 38 x 23 x 10.

Pebble cortex. Prominent bulb suggests hammer struck. Unused.

Not diagnostic of any function or period.

Small Find #18: Subsoil with Field 4.

Irregular flake fragment probably from core trimming. Fine mid-brown flint with light brown mottles, the colour possibly resulting from staining. (35) x (20) x (9).

An irregular flake fragment with some crude steep secondary retouch with no obvious purpose that may be just flaking mis-hits or core trimming.

Not diagnostic of any function or period.

Discussion

These objects all came from separate places and so do not constitute a group of any kind. The differences in technique and type show that they are from a range of different periods. There are two retouched objects SF#09 and SF#10, which might

deserve illustration if needed although neither are distinctly diagnostic of period. All the objects, where identifiable, are made from pebble flint that could be sourced locally. There is an absence of imported material or of larger flakes or the finer techniques that might suggest Later Neolithic activity. None are specifically Mesolithic in character and most could belong to Early Neolithic activity, which could be widely dispersed in the landscape. The only exception is SF09 which is suggested to be of 2nd millennium date although not of an accepted diagnostic type.

Site Location

Trench 01
Trench 02
Trench 03
Trench 04
Trench 05
Trench 06
Trench 07
Trench 08
Trench 09
Trench 10
Trench 11
Trench 12
Trench 14
Trench 15
Trench 16
Trench 19
Trench 20
Trenches 17+18

01 Field Boundary
Trench
Working Corridor

0 200 m

Scale @ A3: 1:5000

Figure 1: Site Location, with Trench and Field Boundary Locations

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Gwynedd Archaeological Trust

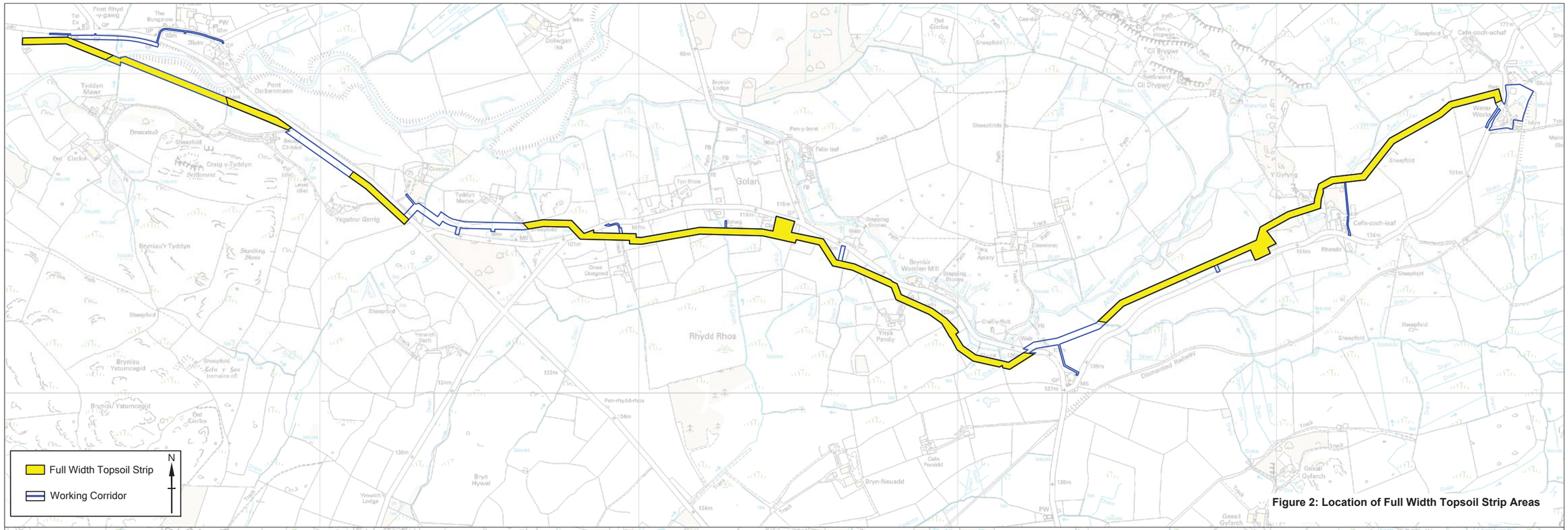

Figure 2: Location of Full Width Topsoil Strip Areas

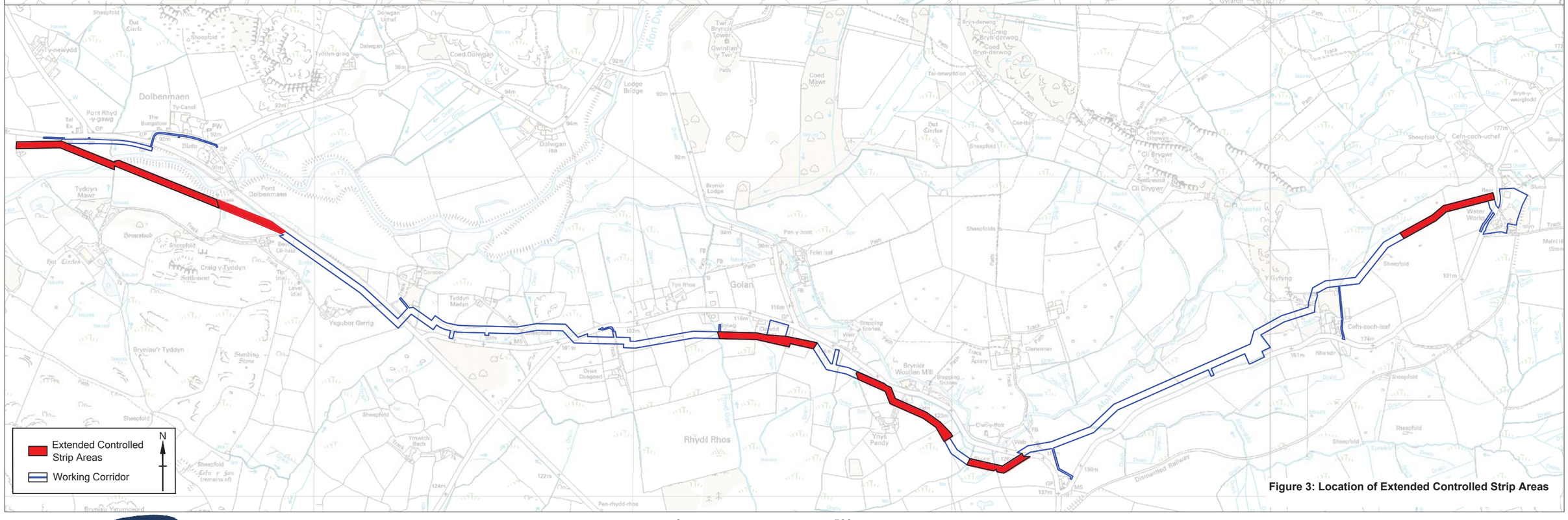

Figure 3: Location of Extended Controlled Strip Areas

0 500 m

1:12,500 @ A3

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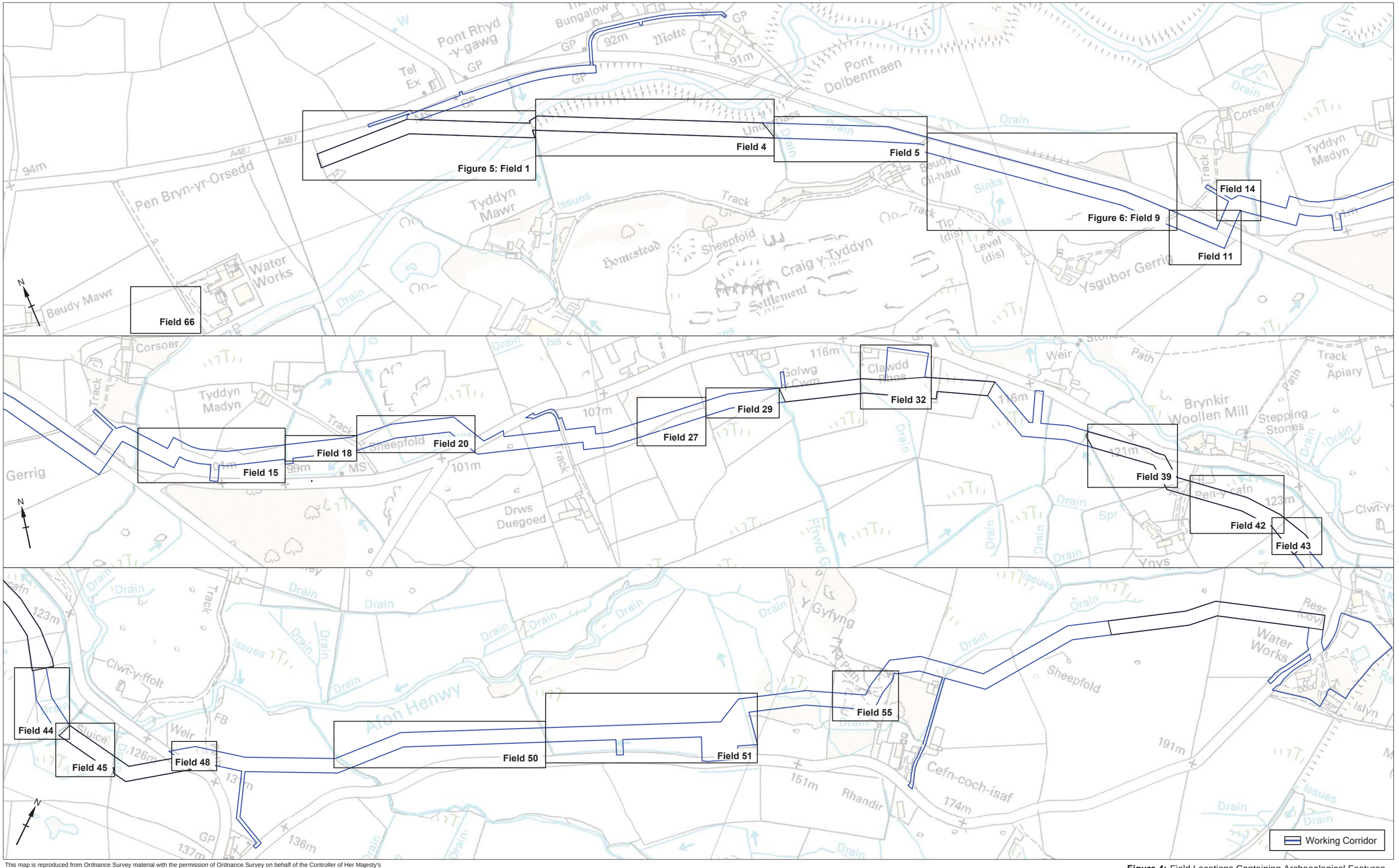
Gwynedd Archaeological Trust



0 200 m

Scale @ A3: 1:5000

Figure 4: Field Locations Containing Archaeological Features

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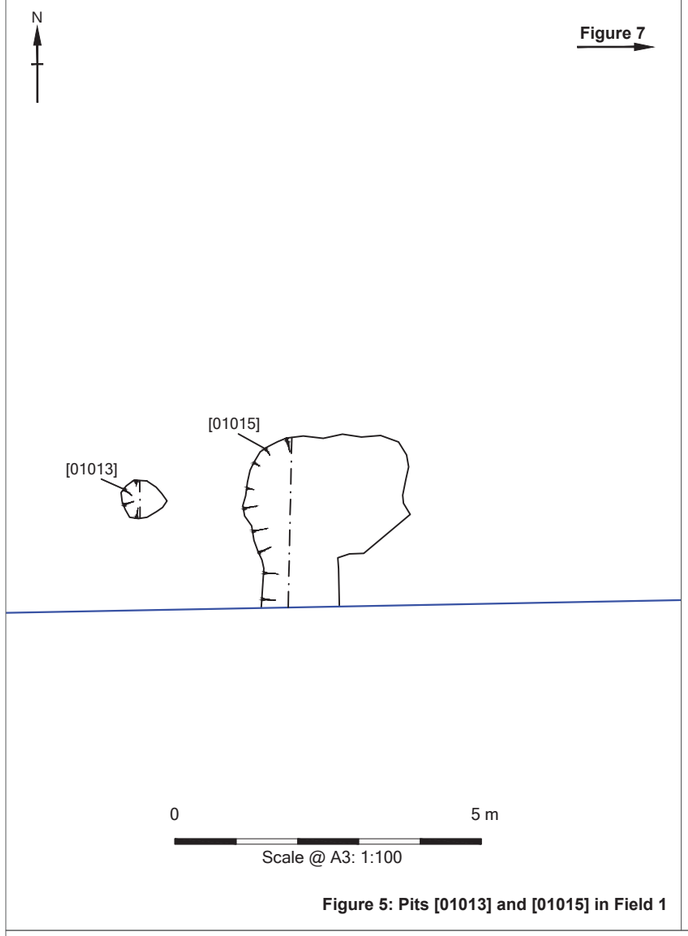

Figure 5: Pits [01013] and [01015] in Field 1

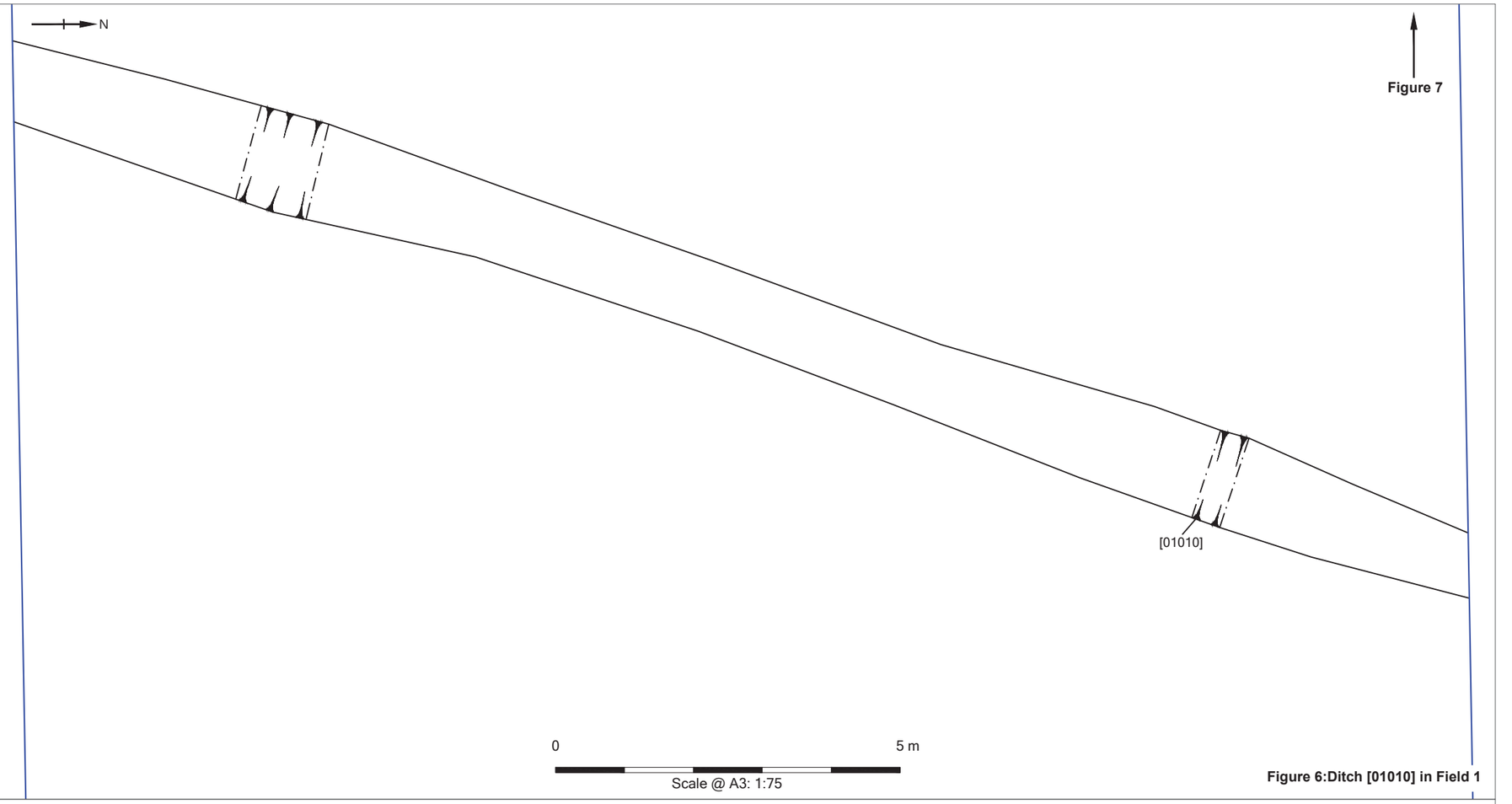

Figure 6:Ditch [01010] in Field 1

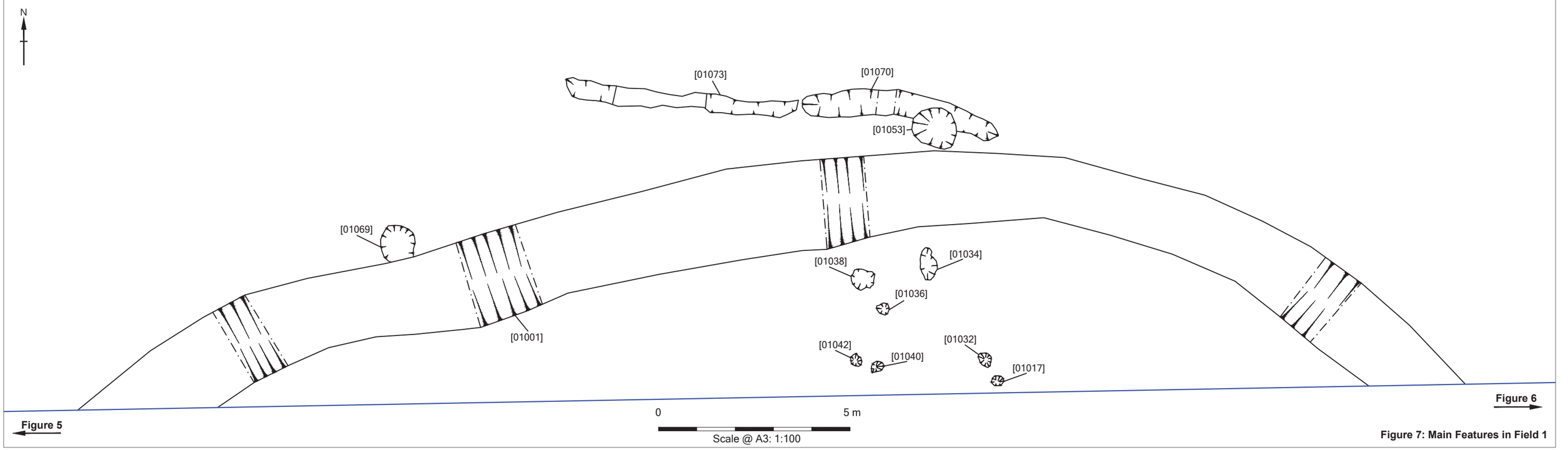

Figure 7: Main Features in Field 1

Working Corridor

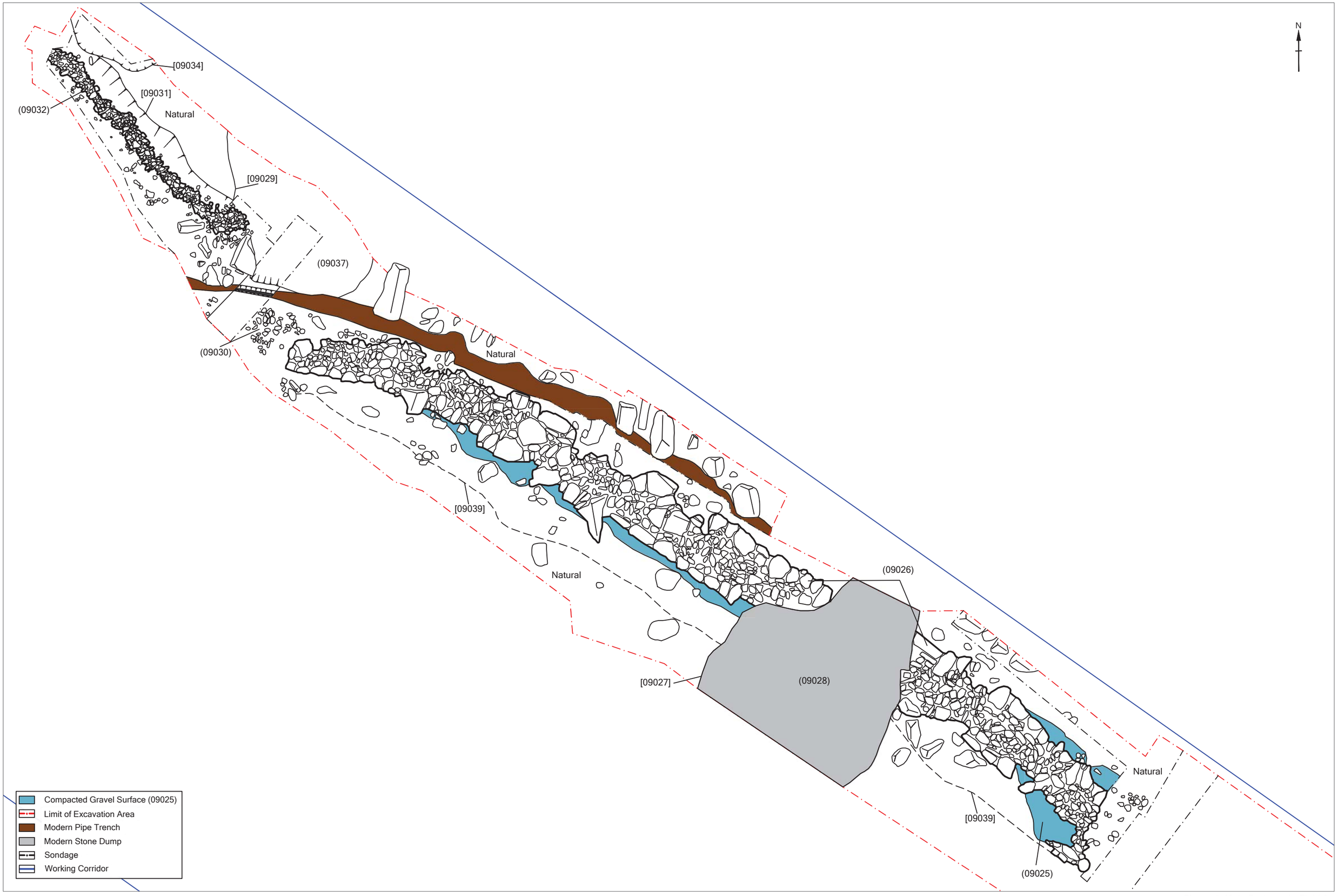

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Figure 6: Main Features in Field 9

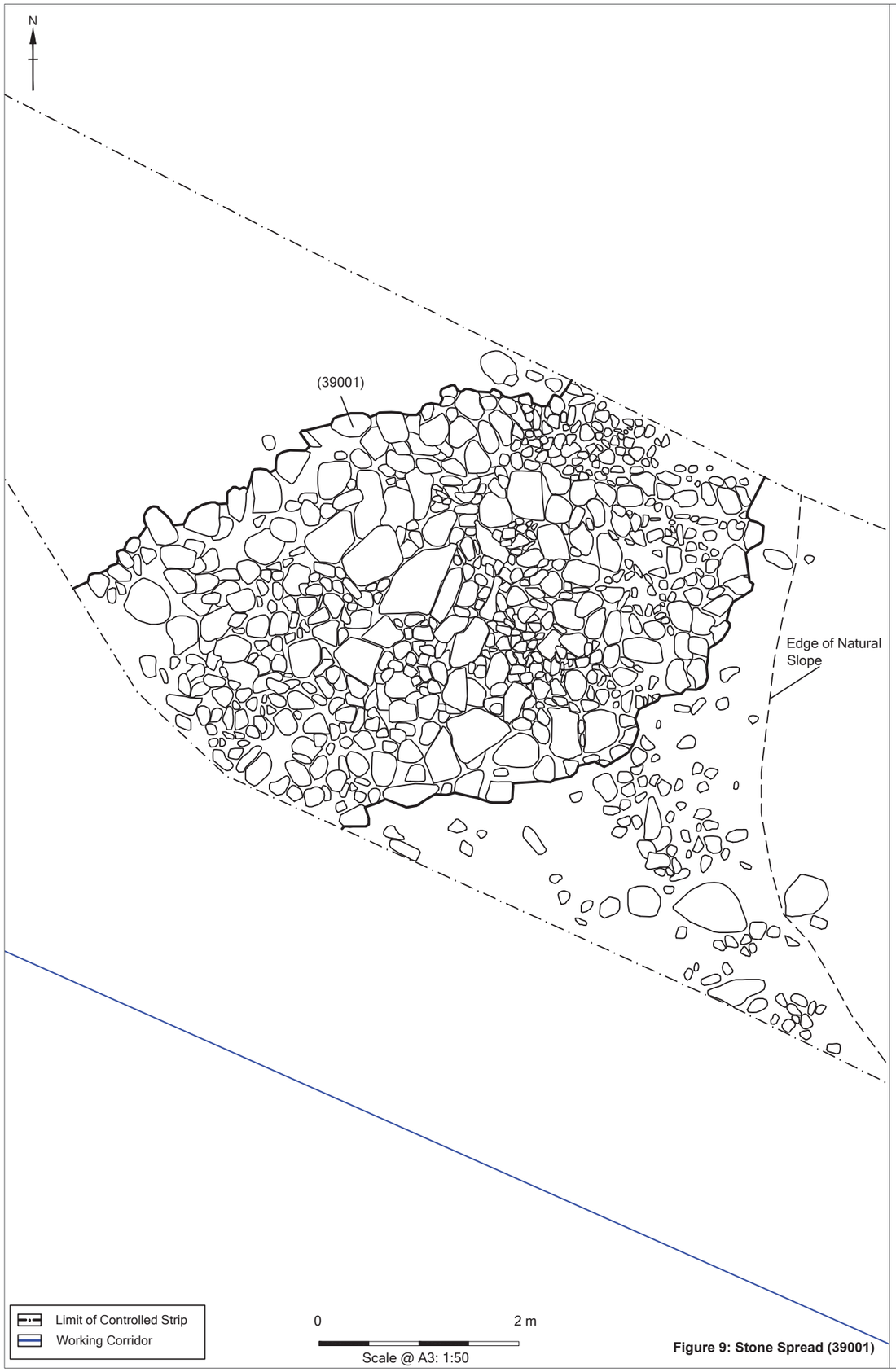

Figure 9: Stone Spread (39001)

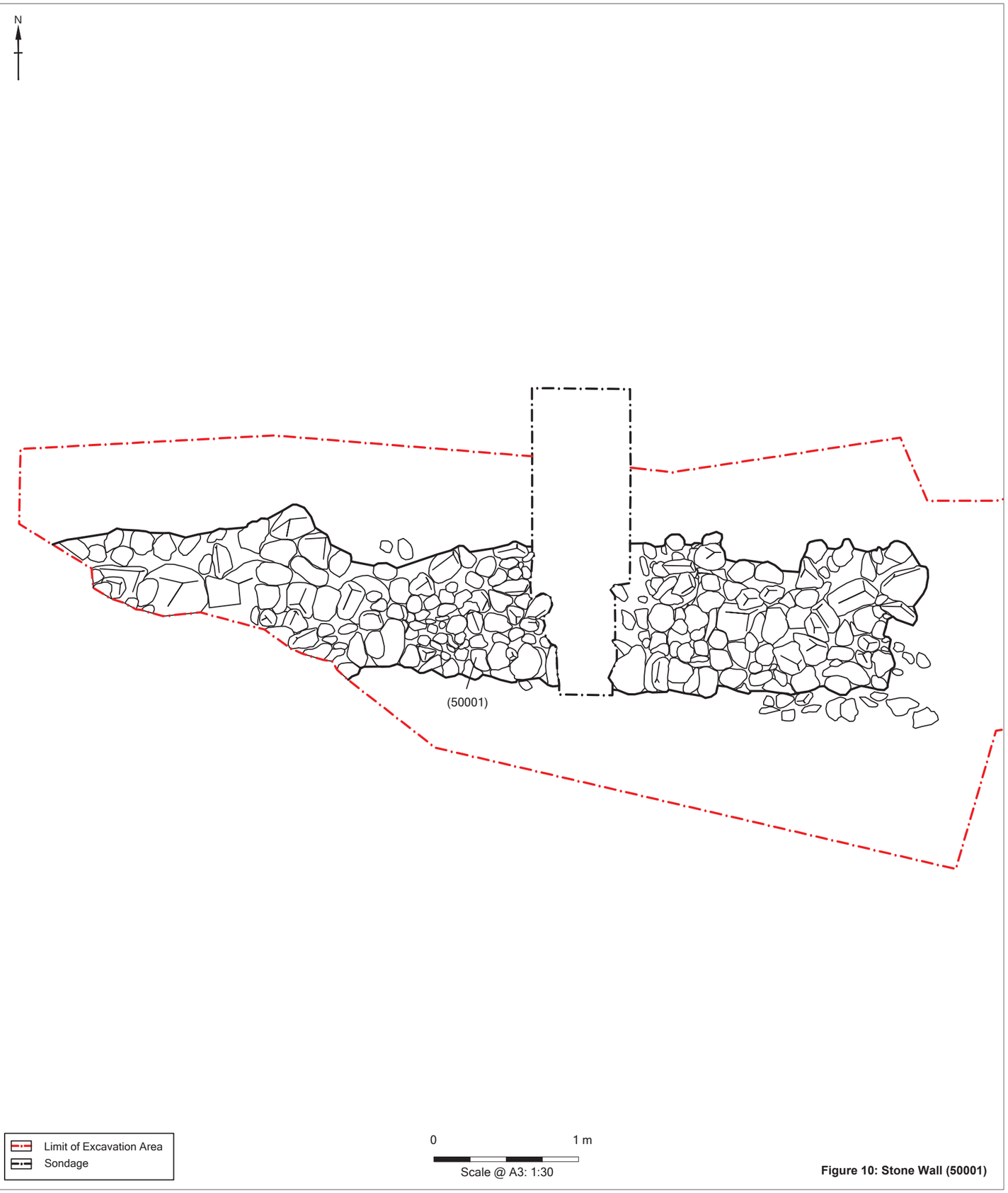

Figure 10: Stone Wall (50001)

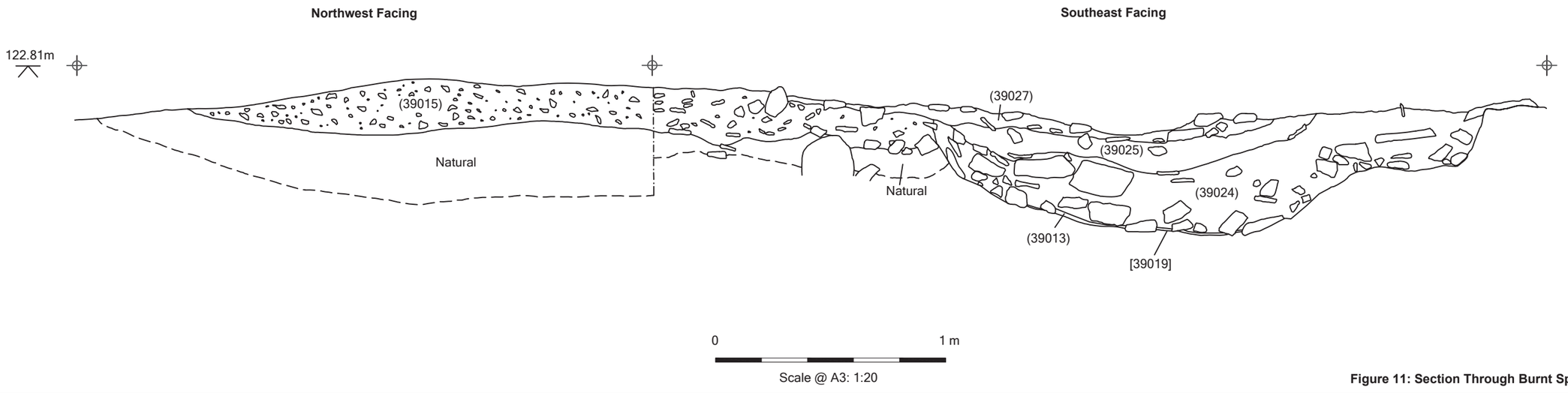

Figure 11: Section Through Burnt Spread (39015) and Pit [39019]

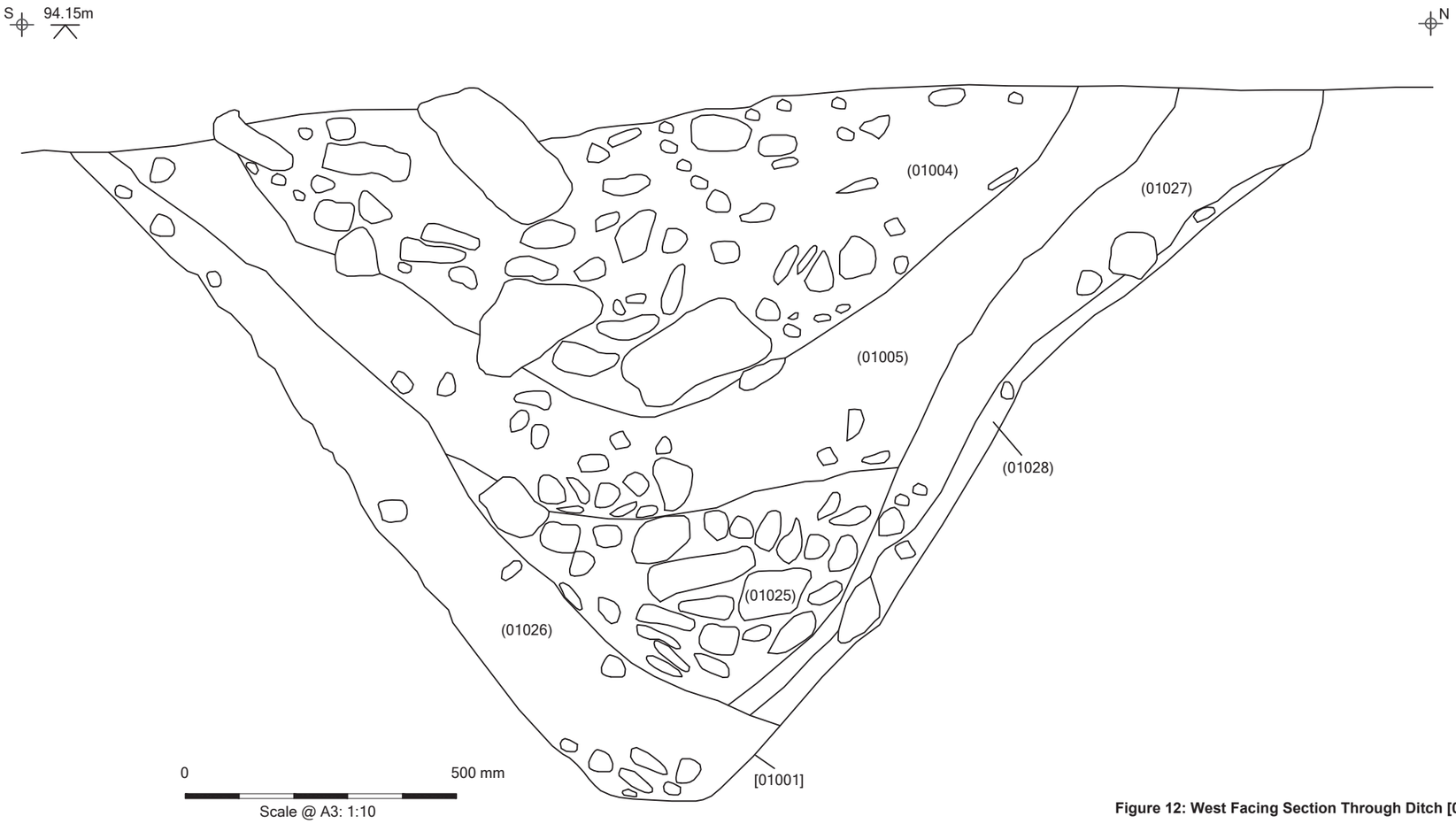

Figure 12: West Facing Section Through Ditch [01001]

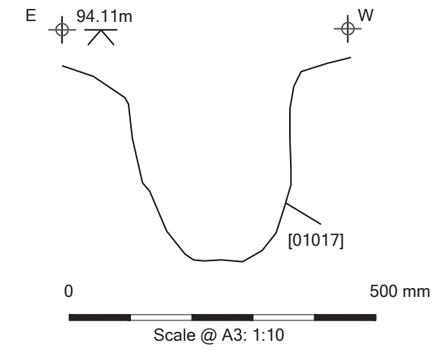

Figure 13: North Facing Profile Through Posthole [01017]

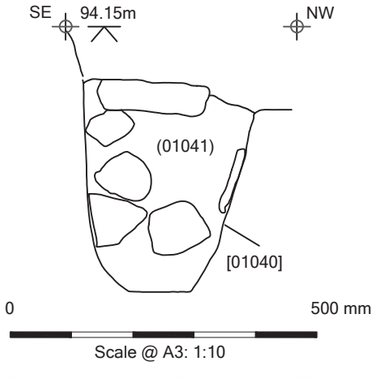

Figure 14: Northeast Facing Section Through Posthole [01040]

Plate 01: Enclosure Ditch [01001]. View from the WNW

Plate 02: ENE Facing Section Threough Enclosure Ditch [01001]

Plate 03: Postholes [01017] and [01032]. View from the northeast

Plate 05: Stone Wall [09032]. View from the southeast

Plate 04: Postholes [01040] and [01042]. View from the NNE

Plate 06: Cobbled Road [09026] (Souitheast Side). View from the southeast

Plate 07: Stone Platform [39001]. View from the south and above (Digitally Rectified)

Plate 08: Possible Burnt Mound [39015]. View from the northeast

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