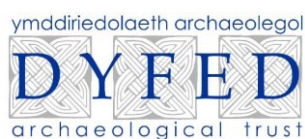


# PENALLY FIRST WORLD WAR TRENCHES, PEMBROKESHIRE: ARCHAEOLOGICAL GEOPHYSICAL SURVEY & EXCAVATION 2019



Penally  
History Group



# DYFED ARCHAEOLOGICAL TRUST

REPORT NO. 2019-25  
PROJECT RECORD NO. 118015

March 2021

## **PENALLY FIRST WORLD WAR TRENCHES, PEMBROKESHIRE: ARCHAEOLOGICAL GEOPHYSICAL SURVEY & EXCAVATION 2019**

By

Alice Pyper, Fran Murphy, Charlie Enright, Hubert Wilson and Roger R C Thomas

*The report has been prepared for the specific use of the client. Dyfed Archaeological Trust Limited can accept no responsibility for its use by any other person or persons who may read it or rely on the information it contains.*

Ymddiriedolaeth Archaeolegol Dyfed Cyf  
Corner House, 6 Stryd Caerfyrddin, Llandeilo, Sir  
Gaerfyrddin SA19 6AE  
Ffon: Ymholiadau Cyffredinol 01558 823121  
Adran Rheoli Treftadaeth 01558 823131  
Epost: [info@dyfedarchaeology.org.uk](mailto:info@dyfedarchaeology.org.uk)  
Gwefan: [www.archaeolegdyfed.org.uk](http://www.archaeolegdyfed.org.uk)

*Dyfed Archaeological Trust Limited*  
*Corner House, 6 Carmarthen Street, Llandeilo,*  
*Carmarthenshire SA19 6AE*  
*Tel: General Enquiries 01558 823121*  
*Heritage Management Section 01558 823131*  
*Email: [info@dyfedarchaeology.org.uk](mailto:info@dyfedarchaeology.org.uk)*  
*Website: [www.dyfedarchaeology.org.uk](http://www.dyfedarchaeology.org.uk)*

The Trust is both a Limited Company (No. 1198990) and a Registered Charity (No. 504616)  
CADEIRYDD CHAIR: Judith Wainwright MA MSc FIC FRSA, CYFARWYDDWR DIRECTOR: K MURPHY BA MIFA

**PENALLY FIRST WORLD WAR TRENCHES, PEMBROKESHIRE:  
ARCHAEOLOGICAL GEOPHYSICAL SURVEY & EXCAVATION 2019**

**CONTENTS**

<b>EXECUTIVE SUMMARY/ CRYNODEB GWEITHREDOL</b>	i
<b>ACKNOWLEDGEMENTS</b>	ix
<b>1. INTRODUCTION</b>	2
1.1 Project Commission	2
1.2 Area Descriptions	2
1.3 Scope of Project	10
1.4 Project Outcomes	10
1.5 Report Outline	11
1.6 Abbreviations	11
1.7 Illustrations	11
1.8 Glossary of terms	11
1.9 Timeline	13
<b>2. THE SITE</b>	14
2.1 Location, Topography and Geology	14
2.2 Historical Background	16
2.3 Historic Maps and Photographs	16
2.4 Contemporary Photographs and LiDAR	19
<b>3. GEOPHYSICAL SURVEY METHODOLOGY</b>	31
3.1 Data Collection	31
3.2 Ground Coverage	31
3.3 Resolution	31
3.4 Data Processing	31
3.5 Data Presentation and Interpretation	31
3.6 Dates of Fieldwork	32
<b>4. EXCAVATION METHODOLOGY</b>	33
4.1 Fieldwork Methodology	33
4.2 Post-Fieldwork Reporting and Archiving	34
<b>5. GEOPHYSICAL SURVEY RESULTS</b>	35
5.1 Area 1 Penally Practice Trenches	35
5.2 Area 2 Penally Training Area	35
5.3 Area 3 Yeomanry Field	35
<b>6. EXCAVATION RESULTS</b>	42
6.1 Four trenches	42
6.2 Area 1 Penally Practice Trenches	42

6.3	Area 2 Penally Training Area	43
<b>7</b>	<b>FINDS</b>	61
7.1	Trench 1	61
7.2	Trench 2	61
7.3	Trench 3	62
7.4	Trench 4	63
<b>8</b>	<b>3D VISUALISATION</b>	65
<b>9</b>	<b>DISCUSSION</b>	68
9.1	Area 1 Penally Practice Trenches	68
9.2	Area 2 – Penally Training Area	68
9.3	Area 3 - Yeomanry Field	69
<b>10</b>	<b>CONCLUSIONS</b>	71
<b>11</b>	<b>HISTORIC ENVIRONMENT RECORD</b>	72
<b>12</b>	<b>OUTREACH</b>	74
12.1	Volunteers	74
12.2	Operation Nightingale	74
12.3	Manorbier School	74
12.4	Community Open Days	75
12.5	Talks	75
12.6	Feedback	75
<b>13</b>	<b>MANAGEMENT RECOMMENDATIONS</b>	76
<b>14</b>	<b>PROJECT TIMELINE</b>	76
<b>15</b>	<b>SOURCES</b>	79

## **FIGURES**

<b>Figure 1:</b>	Location map.	4
<b>Figure 2:</b>	Area [1] - screenshot from Cof Cymru showing the trench system and the current scheduling boundary.	5
<b>Figure 3:</b>	Area [1] - erosion and other damage recorded in 28/08/2015, overlaid on an outline plan of the main trench system.	6
<b>Figure 4:</b>	Area [2] - Left, aerial photo showing Giltar Point on 10/10/1941, and right, a close up showing a line of practice trenches.	7
<b>Figure 5:</b>	Area [2] - The location of the practice trenches in 2017.	8
<b>Figure 6:</b>	Area [3] - Troops digging practice trenches in Yeomanry Field.	9
<b>Figure 7:</b>	Penally Parish Tithe Map (1842).	20
<b>Figure 8:</b>	Detail of Penally Parish Tithe Map (1842).	21
<b>Figure 9:</b>	Plan traced from 1917 Record plan and annotated in 1945 (MoD).	22
<b>Figure 10:</b>	Extract of Plan traced from 1917 Record plan	



and annotated in 1945 (MoD).	23
<b>Figure 11:</b> The first and second edition Ordnance Survey maps 1889 and 1908.	24
<b>Figure 12:</b> Extract of Plan traced from 1917 Record plan and annotated in 1945 (MoD).	25
<b>Figure 13:</b> Vertical aerial photograph, RAF 8th July 1946 (Welsh Government 4642 106G UK 1629 4118).	26
<b>Figure 14:</b> 1951 Vertical aerial photograph of Penally practice trenches.	26
<b>Figure 15:</b> Vertical aerial photograph of Penally practice trenches 23 September 1964.	27
<b>Figure 16:</b> Historic photograph of Penally range looking south to the targets.	27
<b>Figure 17:</b> Penally range looking northwards in the late 1890s or early 1900 earlier firing points can be seen.	28
<b>Figure 18:</b> 1940 aerial photograph of Penally range looking northwest.	28
<b>Figure 19:</b> Yeomanry or Volunteers Field, Penally 1926.	29
<b>Figure 20:</b> 2006 Aerial photograph of Area 1 practice trenches from the northeast.	29
<b>Figure 21:</b> Area 1 Practice trenches LiDAR resolution 1.0m.	30
<b>Figure 22:</b> Area 3 - Google Earth July 2018.	30
<b>Figure 23:</b> Geophysical survey greyscale results in Area 1 above and interpretation plot with orthomosaic below.	36
<b>Figure 24:</b> Geophysical survey greyscale results in Area 2.	37
<b>Figure 25:</b> Geophysical survey greyscale results in Area 3 east of the bypass; and interpretation plot below.	38
<b>Figure 26:</b> Geophysical survey greyscale results in Area 3 west of the bypass; and interpretation plot below.	39
<b>Figure 27:</b> Results of the ground penetrating radar survey that was carried out in the area of the rectangular structure recorded during the geophysical survey.	40
<b>Figure 28:</b> Detailed results of the ground penetrating radar survey showing possible evidence for surviving buried remains of the practice trenches.	41
<b>Figure 29:</b> Location of excavation trenches.	47
<b>Figure 30:</b> Hachure plan of the trench locations at Area 1.	48
<b>Figure 31:</b> Trench 1 hachure plan.	49
<b>Figure 32:</b> Trench 1.	50

<b>Figure 33:</b> Trench 2 plan.	51
<b>Figure 34:</b> Trench 2 - east facing section with pit.	52
<b>Figure 35:</b> Trench 4 plan and northeast facing section.	52
<b>Figure 36:</b> Trench 3 plan.	53
<b>Figure 37:</b> Trench 3 east facing section.	54
<b>Figure 38:</b> Trench 3 west facing section.	54
<b>Figure 39:</b> Penally practice trench DEM survey.	66
<b>Figure 40:</b> Interpretative plot of Penally practice trench from DEM survey.	67
<b>Figure 41:</b> Diagrams of a bombing pit. (Notes for Infantry Officers on Trench Warfare 1916).	70
<b>Figure 42:</b> Trench 3 overlying the 1st edition Ordnance Survey map of 1889.	70
<b>Figure 43:</b> Type of Strong point or redoubt.	71

## PHOTOGRAPHS

**Cover:** Volunteers on the excavation.

<b>Photograph 1:</b> Aerial view of the WWI Practice Trenches with Penally village in the background. In the far background can be seen the town of Tenby.	14
<b>Photograph 2:</b> View looking roughly south of Penally Firing Range.	15
<b>Photograph 3:</b> View looking roughly north across Yeomanry Field.	15
<b>Photograph 4:</b> Trench 1 - Trench 1-Looking south, a post-excavation view of the trench fully cleaned and excavated.	55
<b>Photograph 5:</b> Trench 1-Looking south at recess fully excavated.	55
<b>Photograph 6:</b> Trench 1- Looking east at in situ preserved wooden plank revealed at entrance of recess.	56
<b>Photograph 7:</b> Trench 1- Fragment from metal plate (profile view).	56
<b>Photograph 8:</b> Trench 1- Fragment from metal plate with evidence for edging.	57
<b>Photograph 9:</b> Trench 1- Looking east at trench base continuing into section with true edges of practice trench revealed.	57
<b>Photograph 10:</b> Trench 2, pit cross section in the east edge of trench.	58
<b>Photograph 11:</b> Trench 4, section through pit.	58
<b>Photograph 12:</b> Trench 4, looking south within Machine gun pit, also present within the section is the entrance to the pit which in turn connects to the main trench system located to the south.	59
<b>Photograph 13:</b> Trench 3 showing the corrugated iron traverse.	59
<b>Photograph 14:</b> Trench 3, looking N at preserved timber situated	

within excavated practice trench.	60
<b>Photograph 15:</b> Trench 3.	60
<b>Photograph 16:</b> Trench 3, north end showing stone bank interpreted as a firing point.	61
<b>Photograph 17:</b> A selection of finds from Trench 1.	63
<b>Photograph 18:</b> Trench 2, .22 and (blank) .303 cartridges.	64
<b>Photograph 19:</b> Trench 3, Martini-Henri rifle cartridges, first entered Army service in 1871.	64
<b>Photograph 20:</b> Open Day 15th June.	77
<b>Photograph 21:</b> Manorbier School visit, using the trench periscope.	77
<b>Photograph 22:</b> Manorbier School visit, quiz and treasure hunt.	78
<b>Photograph 23:</b> Manorbier School visit, excavation taster.	78
<b>Rear cover:</b> An unexpected visitor to the site mess tent.	

## TABLES

<b>Table 1:</b> Archaeological and Historical Timeline for Wales.	13
<b>Table 2:</b> List of excavation contexts.	45
<b>Table 3:</b> List of sites add to the Historic Environment Record.	73

**PENALLY FIRST WORLD WAR TRENCHES, PEMBROKESHIRE:  
ARCHAEOLOGICAL GEOPHYSICAL SURVEY & EXCAVATION 2019**

**EXECUTIVE SUMMARY**

Dyfed Archaeological Trust obtained funding from the National Lottery Heritage Fund (NLHF), the Defence Infrastructure Organisation (DIO) and had support from Cadw to investigate, with the help of the local community, the archaeology of the Penally training area, discover how it was used during the First World War and subsequent conflicts during the 20<sup>th</sup> century, and thereby inform the management and conservation of the archaeological resource.

In 2019, investigations took place focussing on three different areas; the Penally practice trenches [Area 1] Penally training area (rifle range) [Area 2], and Yeomanry Field [Area 3].

Geophysical surveys were carried out in all three locations, which helped to inform the location of evaluation excavations in two of the three areas.

Area 1 – Penally Practice Trenches. Sections were cut through two trench lines and a depression forward of the front line. The results showed that the survival of cut features was good, though not always easy to interpret. A 3D survey carried out by drone has provided excellent aerial views of the complex under investigation. The excavations revealed the profile of the trenches cut into the soil and bedrock beneath, and a recess, which would have been covered with corrugated metal sheeting, at the back of the trench. Its function is uncertain, but it may have been a bombing pit for training to throw bombs or grenades, or perhaps a shelter to keep items safe in the trenches. The depression to the front of the trenches was revealed to be a steep sided pit, with a ledge to hold a machine gun, and would have only been big enough for one or two men to climb into to man the gun.

The excavations in Area 2 were targeting further practice trenches which could be seen on wartime aerial photographs. Here the excavations revealed a practice trench which was constructed in an entirely different way to those in Area 1. Here the trench was dug into almost pure sand, and it was necessary to line the trenches with corrugated metal sheeting to prevent the sides collapsing. At the other end of the trench the remains of a stoney bank was found. This was the 100 yard firing point for the earlier rifle range, and numerous spent cartridge cases littered the area.

Yeomanry Field, or Area 3, had been used since the 1860s as a site for military training, and postcards show rows of bell tents where volunteers would camp whilst on a training exercise. A photograph from the early years of the First World War also show troops digging more trenches in this field, and so a geophysical survey was carried out to see if any remains of these trenches survived. The geophysical survey showed a very distinctive feature in this field which might be the practice trenches in the photograph.

Public engagement was a strong element of the project with 21 volunteers working on the excavation, 45 people attending an open day of guided tours to the excavation, and three talks were attended by 58, 28 and over 200 people. In

addition many casual visitors came to see the site. The whole of Manorbier VCP school visited (32 pupils) and came to spend a day on site, experiencing archaeological techniques and learning about life in the trenches in the First World War.

## **CRYNODEB GWEITHREDOL**

Fe gafodd Ymddiriedolaeth Archaeolegol Dyfed gyllid gan Gronfa Dreftadaeth y Loteri Genedlaethol (NLHF) a'r Sefydliad Seilwaith Amddiffyn (DIO), a chymorth gan Cadw, i ymchwilio i archaeoleg ardal hyfforddi Penalun - gyda help y gymuned leol, darganfod sut yr oedd yn cael ei defnyddio yn ystod y Rhyfel Byd Cyntaf a brwydrau dilynol yn ystod yr ugeinfed ganrif, a defnyddio'r canfyddiadau wrth reoli a gwarchod yr adnodd archaeolegol.

Yn 2019, cynhaliwyd ymchwiliadau a oedd yn canolbwyntio ar dair gwahanol ardal; ffosydd ymarfer Penalun [Ardal 1], ardal hyfforddi Penalun (maes saethu) [Ardal 2], a Yeomanry Field [Ardal 3].

Cynhaliwyd arolygon geoffisegol ym mhob un o'r tair ardal, ac fe helpodd hynny i bennu lleoliad cloddiadau gwerthuso mewn dwy o'r tair ardal.

Ardal 1 – Ffosydd Ymarfer Penalun Gwnaed toriad drwy ddwy linell ffos a phant o flaen y rheng flaen. Dangosodd y canlyniadau fod nodweddion a dorwyd wedi goroesi'n dda, ond nad oeddent yn hawdd eu dehongli bob amser. Mae arolwg 3D a wnaed gan ddefnyddio drôn wedi darparu golygfeydd rhagorol o'r awyr ar yr ardal yr ymchwiliwyd iddi. Datgelodd y cloddiadau broffil y ffosydd a oedd wedi'u torri i mewn i'r pridd a'r craigwely islaw, a chilfach, a fyddai wedi'i gorchuddio â haenau o fetel rhychiog, yng nghefn y ffos. Ni ellir bod yn sicr o'i swyddogaeth, ond mae'n bosib mai pwll bomio ydoedd - i ymarfer taflu bomiau neu grenadau, neu efallai gysgodfa i gadw eitemau'n ddiogel yn y ffosydd. Datgelwyd mai pydew ag ochrau serth oedd y pant o flaen y ffosydd. Roedd ysgafell ynddo i ddal gwn peiriant, a byddai wedi bod yn ddigon mawr i un neu ddau ddyn ddringo i mewn iddo i weithredu'r gwn.

Roedd y cloddiadau yn Ardal 2 yn targedu rhagor o ffosydd ymarfer y gellid eu gweld mewn awyrluniau o adeg y rhyfel. Yma, datgelodd y cloddiadau ffos ymarfer a grëwyd mewn ffordd hollol wahanol i'r rhai yn Ardal 1. Yn fan hyn, cloddiwyd y ffos i mewn i dywod pur, bron, ac roedd angen leinio'r ffosydd â haenau metel rhychiog i atal yr ochrau rhag cwmpo. Ym mhen arall y ffos, canfuwyd olion banc caregog. Hwn oedd pwynt tanio 100 llath y maes saethu cynharach, ac roedd nifer fawr o flychau cetrus wedi'u defnyddio ar hyd y lle.

Defnyddiwyd Yeomanry Field, neu Ardal 3, ers y 1860au fel safle ar gyfer hyfforddiant milwrol, ac mae cardiau post yn dangos rhesi o bebyll cloch lle byddai gwirfoddolwyr yn gwersylla tra'r oeddynt yn gwneud ymarfer hyfforddiant. Mae ffotograff o flynyddoedd cynnar y Rhyfel Byd Cyntaf hefyd yn dangos milwyr yn cloddio mwy o ffosydd yn y cae hwn, felly cynhaliwyd arolwg geoffisegol i weld a oedd unrhyw olion o'r ffosydd hyn wedi goroesi. Dangosodd yr arolwg geoffisegol nodwedd neilltuol iawn yn y cae hwn a allai fod y ffosydd ymarfer yn y ffotograff.

Roedd ymgysylltu â'r cyhoedd yn elfen gref o'r prosiect. Gweithiodd 21 o wirfoddolwyr ar y cloddiad, mynychodd 45 o bobl ddiwrnod agored o deithiau tywys i'r gloddfa, a mynychwyd tair sgwrs gan 58, 28 a dros 200 o bobl. Yn ogystal, daeth nifer o ymwelwyr i ymweld â'r safle heb gynllunio ymlaen llaw. Daeth holl ddisgyblion ysgol gynradd WR Maenorbŷr (32 disgybl) i ymweld, gan dreulio diwrnod ar y safle yn dysgu am dechnegau archaeolegol a bywyd yn y ffosydd yn ystod y Rhyfel Byd Cyntaf.



## **ACKNOWLEDGEMENTS**

The key funders of this project were the National Lottery Heritage Fund, and by extension all those who play the lottery, the Defence Infrastructure Organisation provided funding through their Conservation Stewardship fund. Cadw supported the project through grant-aid to the Dyfed Archaeological Trust.

Key partners in the project were the Penally History Group who had expressed an interest in developing a project focussing on the First World War during the centenary commemorations. David Glennerster and John Cliff were particularly supportive in every aspect of the project and provided invaluable local contacts.

Pembrokeshire Coast National Park Authority supported the project and organised an enthusiastic team to remove scrub prior to geophysical survey.

Thanks to Guy Salkeld of DIO for supporting the funding bid, organising the accommodation at Penally camp and acting as liaison with Operation Nightingale. We are very grateful to Major Ewan Smith (MoD) for hosting DAT staff and volunteers at the camp and making all the facilities there available to us. Thanks also to all the staff on the camp.

In terms of knowledge and expertise we are extremely grateful to Roger J C Thomas (Historic England) who, as always, is generous with his information, volunteered for the last week and doubled as a tour guide, gave an illustrated presentation, and brought a handling collection for the pupils of Manorbier school.

Thanks also to the landowners and tenants for providing access for the work to take place.

Huge thanks to all the volunteers who joined us in sometimes challenging conditions; everyone participated with great enthusiasm and good spirits. Tim Fletcher also came with his equipment to carry out an impromptu Ground Penetrating Radar survey and used his drone and captured some wonderful photographs of the sites.

**PENALLY FIRST WORLD WAR TRENCHES, PEMBROKESHIRE:  
ARCHAEOLOGICAL GEOPHYSICAL SURVEY & EXCAVATION 2019**

**1. INTRODUCTION**

**1.1 Project Commission**

- 1.1.1 Dyfed Archaeological Trust obtained funding to undertake archaeological work, with the help of the local community, to improve the knowledge and understanding of the archaeology of the Penally range, how it was used during the First World War and subsequent conflicts during the 20<sup>th</sup> century, and thereby provided information to inform the management and conservation of the archaeological resource.
- 1.1.2 This project formed part of a suite of assessments researching the archaeology of the First and Second World Wars grant-aided by Cadw across Wales. Over the centenary of the First World War different themes were explored, as set out in the research agenda Modern Military Matters (Scofield 2006), a research agenda for Conflict Archaeology which was adopted by the Welsh Conflict Archaeology Advisory Panel (WelCAAP) while a specifically Welsh Research Agenda was developed.
- 1.1.3 The project partners included Penally History Society, the Defence Infrastructure Organisation (DIO) and Pembrokeshire Coast National Park Authority (PCNPA). These organisations offered their support 'in kind' contributions and volunteer time.
- 1.1.4 A key element of the project was opening the investigations out to members of the public and other groups. Members of the local community were invited to take part in the excavations, as well as other archaeological techniques such as geophysical survey.
- 1.1.5 The project focused on three geographic areas (Fig. 1):
  - [1] The Penally First World War practice trenches – the Scheduled Monument and environs
  - [2] The Penally Training Area, from the practice trenches to the rifle ranges and Giltar Point
  - [3] Yeomanry Field

**1.2 Area Descriptions**

**[1] *Penally First World War Practice Trenches, Scheduled Monument PE483, PRN 33458 (centred on NGR SS 1120 9853)***

- 1.2.1 The Penally Practice Trenches were designated a Scheduled Monument in 1997 (Fig. 2). Below is the Cadw scheduling summary description (accessed from the Cof Cymru website 26/03/2021):
- 1.2.2 'The monument consists of the remains of World War I practice trenches. This complex consists of two main lines of trenches running south west to north east and facing northwest. In plan the trenches resemble a line of cresellations [sic] c. 4m long and 4m deep with earthen upcast banks to front and rear to give a depth of c. 1.4 -2.0m to the bottom which is partly silted up. This was a common form of front-line trench in WWI designed to stop the blast form [sic] artillery shells running any

distance. The two main lines of trenches are connected by four sinuous communication trenches each with their own small redoubts. These four trenches combine into three which run behind the rear trench towards a command post which shows an irregular oval area of shallower trenches. The trenches were positioned so that they could be over-fired from guns sited elsewhere on the range.'

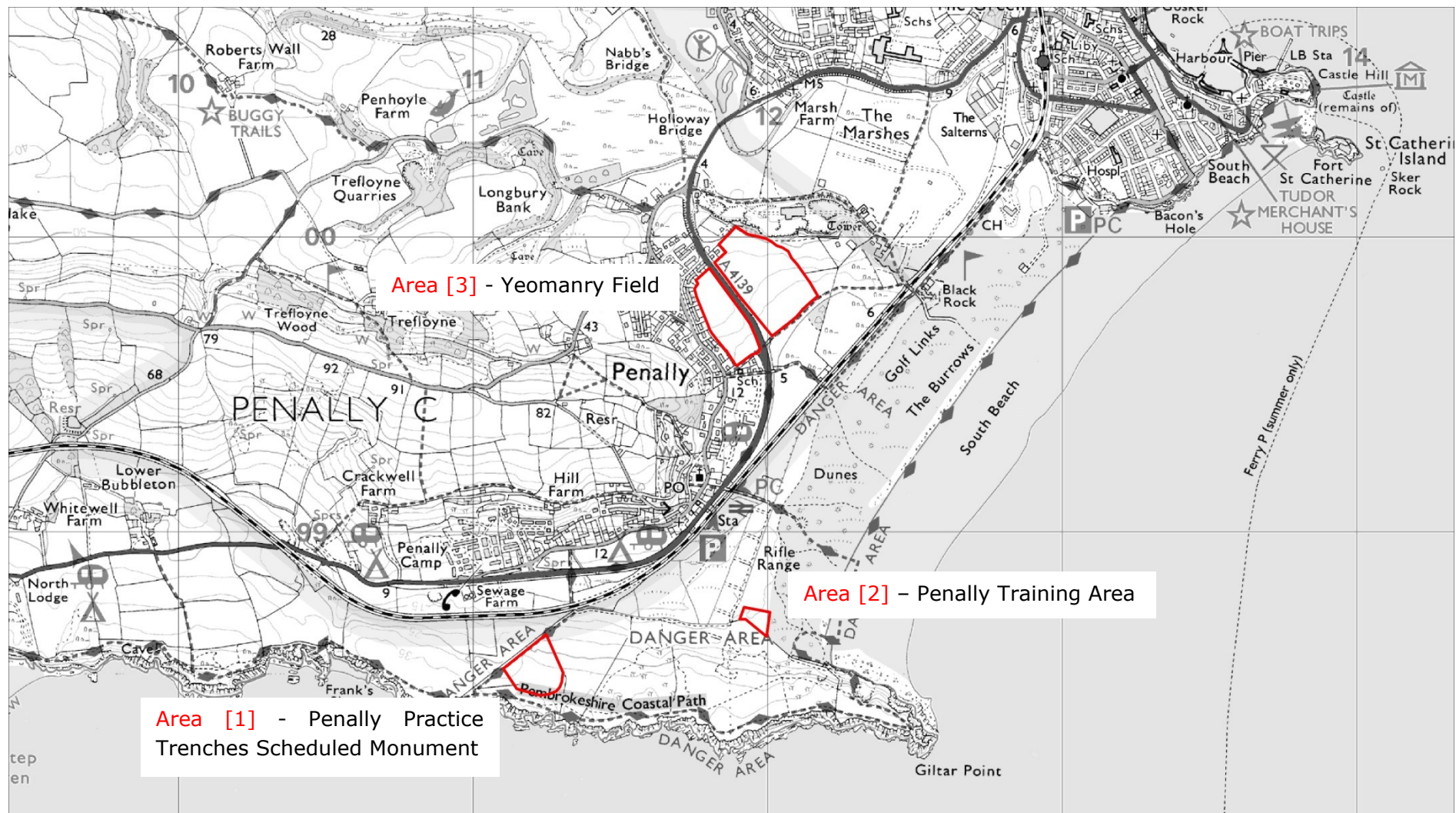
- 1.2.3 Aerial photographs show that the scheduled area in red (Fig. 2) does not fully reflect the archaeological remains as shown on the photographs.
- 1.2.4 Past archaeological assessment of the site has included a desk-based assessment and a topographical condition survey carried out by Wessex Archaeology in 2004 (Fig. 3). This report identified issues with the condition of the monument including encroaching vegetation, soil slumping, rabbit warrens, and sheep erosion. The Quinquennial review undertaken in 2015 also identified that vegetation had encroached on the eastern side of the monument since the 2004 Wessex Archaeology report and that animal erosion was still an issue of concern.

**[2] Penally Training Area PRN 109340 (centred on NGR SS 1195 9870)**

- 1.2.5 The Penally Training Area extends along the cliff top from the Practice Trenches to Giltar Point to the east (Fig. 4).
- 1.2.6 Rifle ranges were established on The Burrows at the southern end of South Beach; one in the 19<sup>th</sup> century, a second at the turn of the 19<sup>th</sup>/20<sup>th</sup> centuries and a third during the Second World War. Historic maps and aerial photographs depict a landscape continually reused for military training during the late 19<sup>th</sup> and 20<sup>th</sup> centuries, including further practice trenches constructed in between two of the rifle ranges (Fig. 5). At present this military landscape is littered with sites and features which are little understood and not recorded.

**[3] Yeomanry Field PRN 107820 (centred on NGR SS 1190 9979)**

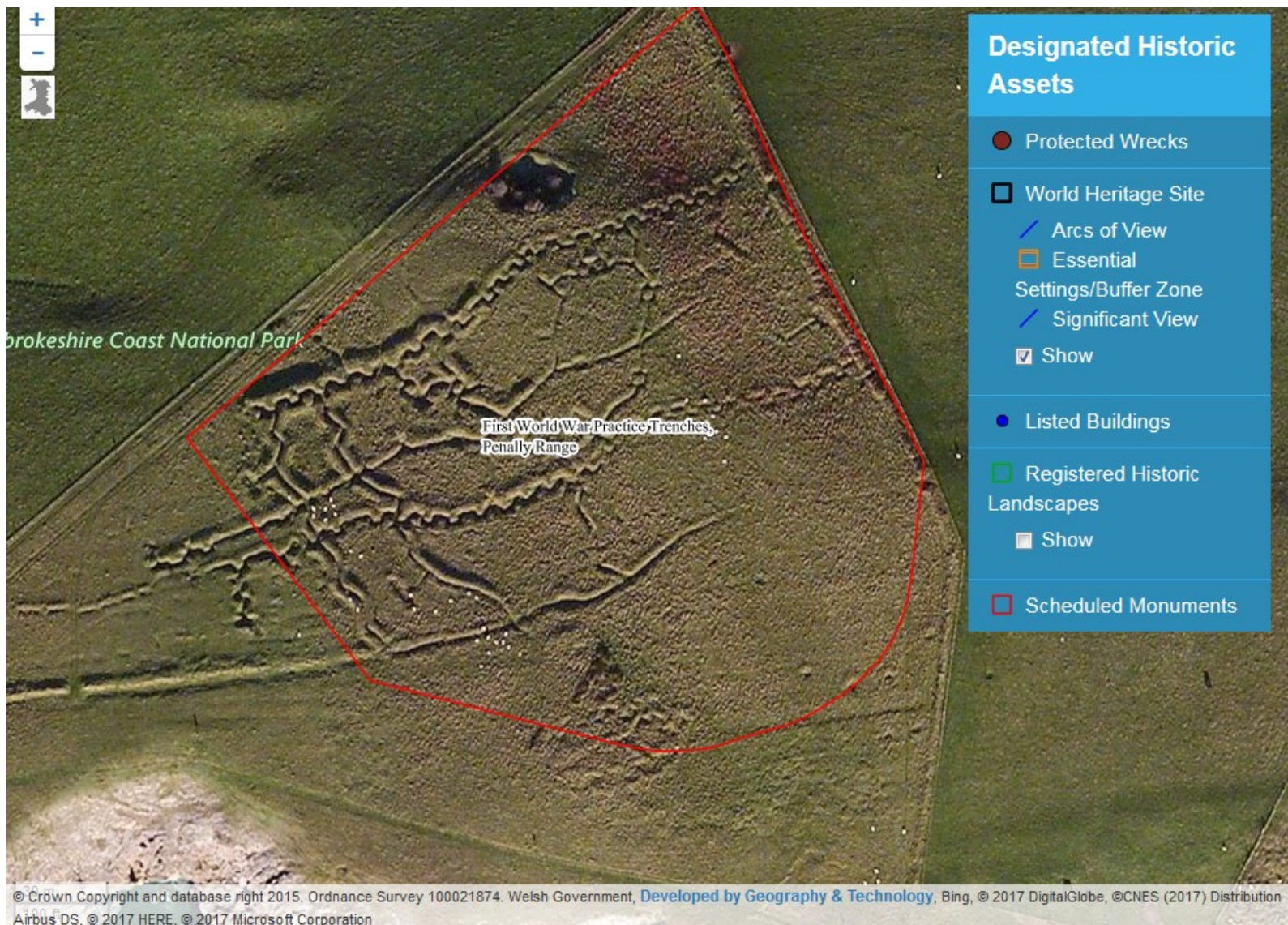
- 1.2.7 The camp at Penally was established in 1860 as a musketry camp and so has a long history of military training. Summer camps were routine for the volunteers to undertake training exercises and these took place on Yeomanry or Volunteers Field. A number of postcards and images show camps taking place there throughout the first half of the 20<sup>th</sup> century. There is also photographic evidence to show that practice trenches were dug in this location (Fig. 6). Numerous artefacts have also been found in the gardens of houses which have been built on the fringes of the field. Yeomanry Field has now been bisected by the Penally by-pass and agricultural activity has removed any clear surface evidence of military activity.



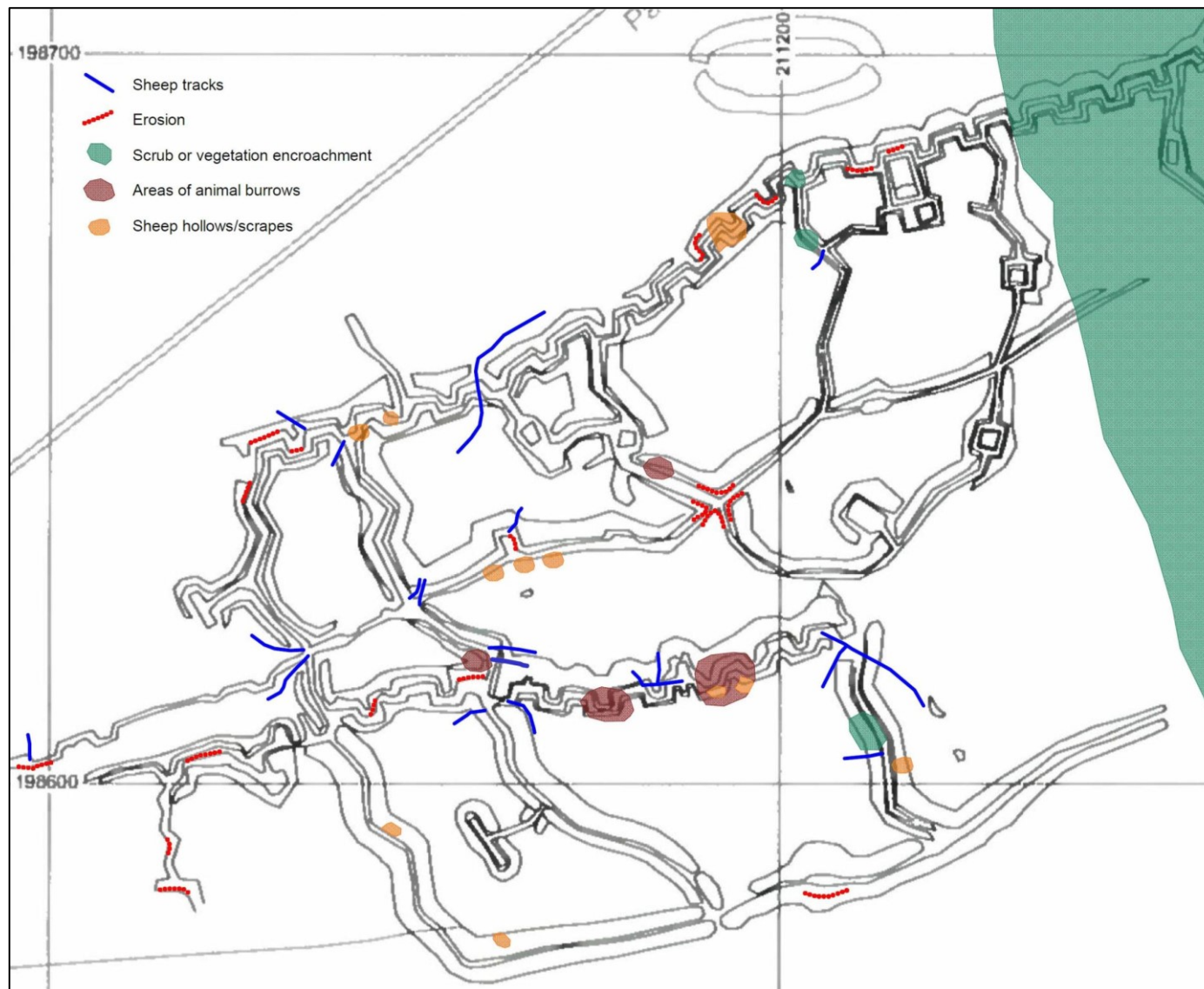
**Figure 1:** Location map.

Reproduced from the Ordnance Survey 1:25,000 scale Landranger Map with the permission of The Controller of Her Majesty's Stationery Office, © Crown Copyright Dyfed Archaeological Trust Ltd., Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AE. Licence No 100020930



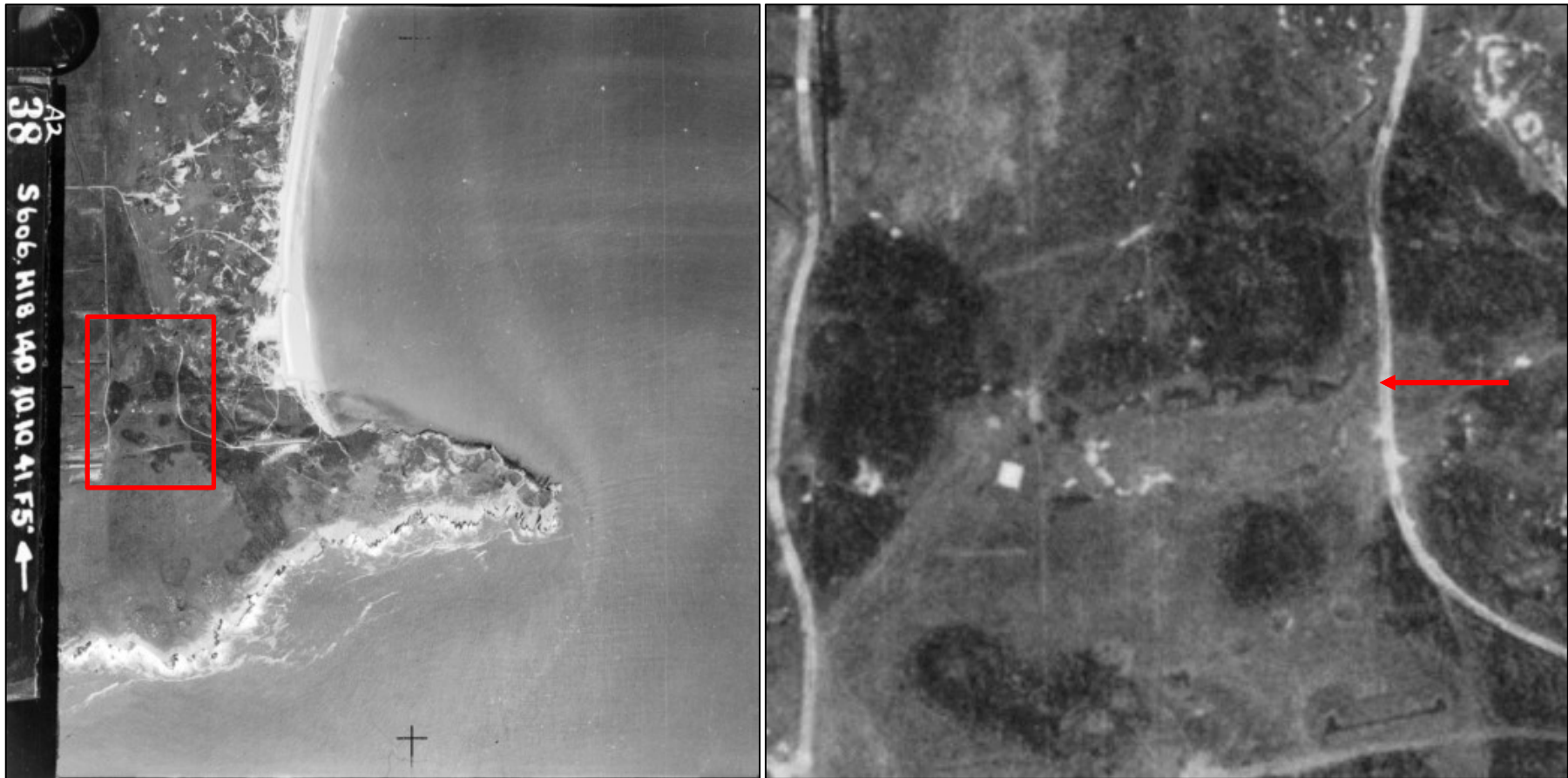


**Figure 2:** Area [1] – screenshot from Cof Cymru showing the trench system and the current scheduling boundary. [Cadw.gov.wales/historicenvironment/recordsv1/cof-cymru/?lang=en](http://Cadw.gov.wales/historicenvironment/recordsv1/cof-cymru/?lang=en) (accessed 26/03/2021)



**Figure 3:** Area [1] – erosion and other damage recorded in 28/08/2015, overlaid on an outline plan of the main trench system (Wessex Archaeology 2004).





**Figure 4:** Area [2] – Left, aerial photo showing Giltar Point on 10/10/1941, and right, a close up showing a line of practice trenches. (Medmenham collection M3009\_A2\_38)



**Figure 5:** Area [2] – The location of the practice trenches in 2017.



**Figure 6:** Area [3] – Troops digging practice trenches in Yeomanry Field. Image provided by Roger JC Thomas.

### **1.3 Scope of Project**

1.3.1 A Written Scheme of Investigation (WSI) for the proposed geophysical survey and excavation was prepared by Dyfed Archaeological Trust prior to the commencement of the archaeological investigations. The WSI outlined the following tasks for the project:

- Provision of a written scheme of investigation to outline the methodology for the geophysical survey and intrusive trial trench excavation which Dyfed Archaeological Trust will undertake;
- To undertake geophysical survey within the three areas to assist in understanding the extent and survival of archaeological features;
- Following the results of the geophysical survey to undertake targeted trial trench excavation in all three areas, if possible;
- To establish the state of preservation, character, extent and date range for the targeted archaeological deposits (identified by the geophysical survey);
- To engage members of the local community and others in all the archaeological works;
- Production of a report and an archive of the results.

1.3.2 The overall aims of the project were summarised as:

#### **Area [1]**

- To more accurately record the full extent of the practice trench system, which includes two redoubts not currently fully included within the scheduled area
- To investigate the surrounding area and establish the presence or absence of associated archaeology
- To provide digital 3-D model to aid the interpretation of the earthworks and how they were used
- To report on the fieldwork and produce an archive

#### **Area [2]**

- To investigate the remains of a practice trench system built at the time of the First World War
- To identify and record the archaeology of the military training area
- To evaluate and characterise potentially significant archaeological remains
- To report on the fieldwork and produce an archive

#### **Area [3]**

- To identify and locate archaeological remains within Yeomanry Field
- To evaluate and characterise potentially significant archaeological remains
- To raise awareness of the military history of Penally
- To report on the fieldwork and produce an archive

### **1.4 Project Outcomes**

1.4.1 The main project outcomes were summarised as:



- an improved understanding of the archaeology of the military training area, with results recorded and interpreted and the disseminated through a display for use by the Penally History Society, and through DAT's website. The reports and updated information will be available through the Historic Environment Record available on [www.Archwilio.org.uk](http://www.Archwilio.org.uk).
- The improved knowledge and understanding of the archaeological resource of Penally will allow the DIO to sympathetically manage the archaeology and landscape into the future.

#### 1.4.2 The outcomes for heritage were defined as:

- Improved knowledge and understanding
- Archaeology will be better recorded
- Raised awareness of archaeology
- Better condition and visibility of archaeological monuments
- Archaeology recorded in Historic Environment Record

#### 1.4.3 The outcomes for people were defined as:

- Training and skills developed amongst participants and partners
- People will have learnt about heritage
- Social interaction across a diverse range of participants and partners
- Increased fitness from outdoor physical exercise
- Increased sense of wellbeing from mental stimulation and social interaction

### 1.5 Report Outline

- 1.5.1 This report provides a summary and discussion of the archaeological evaluation and its results and puts those results within their regional and national context where possible.

### 1.6 Abbreviations

- 1.6.1 Sites recorded on the Regional Historic Environment Record<sup>1</sup> (HER) are identified by their Primary Record Number (PRN) and located by their National Grid Reference (NGR). DAT Archaeological Services – DAT-AS; Dyfed Archaeological Trust-Development Management – DAT-DM; Written Scheme of Investigation – WSI; RCAHMW – Royal Commission on the Ancient and Historical Monuments of Wales.

### 1.7 Illustrations

- 1.7.1 Printed map extracts are not necessarily produced to their original scale.

### 1.8 Glossary of Terms

- 1.8.1 Communication trench – narrow trenches used to go to and from the front line trenches and support trenches.

---

<sup>1</sup> Held and managed by Dyfed Archaeological Trust, Corner House, 6 Carmarthen Street, Llandeilo SA19 6AE

Redoubt – a self contained refuge outside of the main defences, usually an enclosed ring of defences

Fire bay – a section of trench with a traverse to either side where soldiers would fire from.

Fire step – a step running along the forward side of the trench which soldiers could stand on to fire at the enemy. The bottom of the trench was deeper so soldiers could walk along without exposing their heads to enemy fire.

Island traverse – a centre island in the trench where troops moving in opposite directions can pass each other.

Observation post – from where the enemy movements or actions are observed.

Parados – Raised earth behind the rear trench wall used to help diffuse the shock of high explosives going off behind the line.

Parapet – raised bank to the front of the trench closest to the enemy, offering protection to troops observing the enemy

Strong point – a self-contained refuge outside of the main defences, usually an enclosed ring of defences.

Support trench – a secondary trench behind the front line system and also used to house the supply areas, command elements and artillery areas.

Traverse – a trench was rarely a straight feature but built in sections which dogleg back and forward to localise the impact of any artillery blast.



## 1.9 Timeline

1.9.1 The following timeline (Table 1) is used within this report to give date ranges for the various archaeological periods that may be mentioned within the text.

**Table 1:** Archaeological and Historical Timeline for Wales.

Period	Approximate date	
Palaeolithic –	c.450,000 – 10,000 BC	Prehistoric
Mesolithic –	c. 10,000 – 4400 BC	
Neolithic –	c.4400 – 2300 BC	
Bronze Age –	c.2300 – 700 BC	
Iron Age –	c.700 BC – AD 43	
Roman (Romano-British) Period –	AD 43 – c. AD 410	Historic
Post-Roman / Early Medieval Period –	c. AD 410 – AD 1086	
Medieval Period –	1086 – 1536	
Post-Medieval Period <sup>2</sup> –	1536 – 1750	
Industrial Period –	1750 – 1899	
Modern –	20 <sup>th</sup> century onwards	

<sup>2</sup> The post-medieval and industrial periods are combined as the post-medieval period on the Regional Historic Environment Record as held by Dyfed Archaeological Trust

## **2. THE SITE**

### **2.1 Location, Topography and Geology**

- 2.1.1 Approximately 2km southwest of the town of Tenby lies Penally village, with Penally Training Camp lying on the southwest edge of the village. The WWI Penally Practice Trenches (Area [1]) are situated on fairly level ground at 30m OD, on a cliff top location to the south of Penally Training Camp and cover an area of just under 3ha (Photo. 1).



**Photograph 1:** Aerial view of the WWI Practice Trenches with Penally village in the background. In the far background can be seen the town of Tenby (Tim Fletcher).

- 2.1.2 The Penally Training Area extends along the cliff top from the Practice Trenches to Giltar Point, and to the northeast lies the existing rifle range associated with the Training Camp. At least three rifle ranges were established on the sand dunes of The Burrows at the southern end of South Beach; one in the 19<sup>th</sup> century (PRN 29912), a second at the turn of the 19<sup>th</sup>/20<sup>th</sup> centuries (PRN 29913) and a third was established during the Second World War (PRN 111277) to the west of the first.
- 1.2.6 The current rifle range is situated on low lying ground at 10m OD and is bounded to the northwest by a railway track and to the southeast by a modern golf course set within the sand dunes of The Burrows that border South Beach (Photo. 2)
- 1.2.7 Yeomanry Field is a pasture field covering an area of roughly 10.5ha (Photo. 3) that has been bisected by the construction of Penally by-pass (A4139). The field lies on the northeast side of Penally village at between 10-20m OD.

- 1.2.8 All three areas lie mainly within the geological sedimentary bedrock type of the Pembroke Limestone Group, formed approximately 329 to 359 million years ago in the Carboniferous period. No superficial geological deposits are recorded on geological maps.



**Photograph 2:** View looking roughly south down to Penally Firing Range.



**Photograph 3:** View looking roughly north across Yeomanry Field.



## **2.2. Historical Background**

- 2.2.1 The Penally military training area was established in the 19<sup>th</sup> century, on what was agricultural land belonging to the Picton Castle Estate. Its establishment followed the end of the Crimean war in 1856 when there was a growing distrust between the former allies of France and Great Britain. An expansion of France's military forces led to a fear of invasion and prompted a Royal Commission, established in 1859, on the defence of the United Kingdom. This recommended a huge program of work constructing coastal batteries and fortifications to protect the southern dockyards along the coast of Great Britain. The efficiency of Britain's fighting forces was also called into question and led to the establishment of musketry camps to provide better training facilities for the troops.
- 2.2.2 Penally was one of these musketry camps, constructed in 1860, with troops from the garrison at Pembroke Dock in occupation by September of that year and, as reported in the newspapers, undertaking rifle practice at the long ranges. Permanent barracks were still being erected (The Welshman, 21<sup>st</sup> September 1860).
- 2.2.3 Whilst a number of permanent buildings were constructed at the camp itself, these buildings were for the use of the training staff rather than visiting troops who were accommodated under canvas. The field to the northeast of the village (Area 3), now bisected by the Penally by-pass, was used on a regular though temporary basis for seasonal camps. It became known locally as Volunteers, or Yeomanry Field (Fig. 1).
- 2.2.4 The camp's reason for being was, of course, the rifle ranges, which were established on the sand dunes of Penally burrows, orientated north-northeast with the butts embedded at the base of the slope rising up to Giltar Point.

## **2.3 Historic Maps and Photographs**

### **Area [1] Penally Practice Trenches**

- 2.3.1 The Penally tithe survey of 1842 shows this area as under agricultural use; recorded as arable, named Fallow Field Park, owned by Sir Richard Bulkely Phillips and occupied by Robert Waters (Fig. 7).
- 2.3.2 The first edition Ordnance Survey map, 25inch, published in 1889, shows a small quarry, labelled 'Old Quarry' and marked with trees, and the same field boundaries which exist today. This is replicated on the second edition Ordnance Survey map, 25inch, published in 1907, not reproduced here.
- 2.3.3 A plan discovered within the MoD records by Major Ewan McGregor (MoD) named 'Rifle Ranges – Penally Drawing' appears to have been based on a 1917 plan and annotated in 1945 (Fig. 9). This marks out the area owned by the War Department and follows the boundary from the northeast, No 3 lookout, to southwest No 8 lookout (Fig. 10).
- 2.3.4 The earliest photographic sources for the trench system which have been identified are from 1946 and show the trench layout as they are in the 21<sup>st</sup>

century, albeit the trenches have since become somewhat more overgrown with bracken encroaching from the eastern side. There is no indication from this photograph that the trenches had been in recent use – no signs of wear or erosion which might indicate that troops had been using them for training during the Second World War (Fig. 13).

- 2.3.5 The clearest photographs are those taken in 1951 and 1964 which show very clearly the trench system allowing many features to be identified (Figs 14 and 15).

### **Area [2] Penally Training Area**

- 2.3.6 The Penally tithe survey of 1842 shows this area as under agricultural use; recorded as the Burrows and under pasture, owned by Sir Richard Bulkely Phillips and occupied by Rober Waters (Fig. 7).
- 2.3.7 The first edition Ordnance Survey map, published 1889, shows three sets of butts and three firing lanes lying side-by-side with staggered firing points extending to the northeast and marked up to 900 yards, where the range is cut by the railway. The easternmost lane, less constrained by the railway line, reached 1000 yards.
- 2.3.8 By the 1908 edition Ordnance Survey this range (PRN 29912) has been marked as disused, with a new range established to the east just above the high-water mark, with firing points up to 600 yards (PRN 29913). A target gallery c. 100 yards in width is shown with a flag staff at the west end and buildings at either end which probably form marker huts and targets stores (PRN 30041; Fig. 11).
- 2.3.9 The record plan of the rifle ranges (Fig. 12) mentioned above, in the possession of the MoD, is a 1945 tracing of a 1917 plan and records this as 'A' Rifle Range. A further range labelled 'B' Rifle Range had been established to the west and it is this one which is still in use today (PRN 111277).
- 2.3.10 This plan shows the complexity of the training area, not only are the two rifle ranges shown, but a grenade range, and down the centre between the two rifle ranges is 'Field Firing Range' (Battle Practice), a 'Trench Mortar Range' (Firing Area and Target Area). To the west is also a 30-yard range and target store (PRN 125765).
- 2.3.11 A postcard from the early 20<sup>th</sup> century depicts the easternmost rifle range (PRN 29913) in use (Fig. 16). Sixteen targets can be seen, although only eight are in use at the time of the photograph. A further postcard, undated, depicts it looking northwards and firing points can be seen (Fig. 17).
- 2.3.12 The evidence from the wartime aerial photographs of 1941 show two rifle ranges (PRNs 111277 and 29913), which appear to be in use and the crenellated line of a fire trench which appears redundant and grown over (Fig. 4).
- 2.3.13 An oblique aerial photograph from June 1940 shows the Penally ranges and whilst areas are overgrown with bracken or scrub, features and structures

can be seen (Fig. 18). In addition to the fire trench visible in the vertical photograph, what appears to be at least two zigzag communication trenches extend to the north possibly connecting to a reserve or support trench. Other structures are also visible.

### **Area [3] Yeomanry Field**

- 2.3.14 The Penally tithe survey of 1842 records this area as Sandy Park, under arable and pasture, owned by Charles Mathias and occupied by Arthur and William Williams (Fig. 8).
- 2.3.15 The first and second edition Ordnance Survey maps show no change; the temporary nature of the camps clearly left no permanent trace of buildings or structures.
- 2.3.16 Numerous images on postcards depict the use of Yeomanry Field for summer camps from the 19<sup>th</sup> century through to the 20<sup>th</sup> century (Fig. 19). These typically depict rows of canvas bell tents and larger marquees. As in figure 19 far left, some light infrastructure including cubicles, cess pits and service pipes may have been constructed to provide water for ablutions.
- 2.3.17 A photograph which dates from 1914-15 shows troops digging practice trenches (Fig. 6) has been confidently placed within Yeomanry Field by aligning the landmarks of Tenby which lie on the horizon behind the men. This shows the construction of trenches underway – the men are digging shallow trenches and creating revetments from wicker hurdles and packed stone. The photograph has been interpreted by Roger J C Thomas:

The photograph shows men of the Royal Engineers and the Border Regiment digging trenches to the north-west of Volunteers' Field, Penally, Pembrokeshire. The men grouped to the right hand-side in the foreground are all Royal Engineers, while the men in the middle distance and background come from 2<sup>nd</sup> Battalion, The Borders Regiment, who were stationed at Llanion Barracks, Pembroke Dock in 1914. There is a great deal of detail in the photo when you zoom in and buildings in Tenby can be seen in the background, including the two army huts at Silent Battery. The officer standing in the centre of the photo pointing downwards is a 2<sup>nd</sup> Lieutenant. If you look at the extreme left of the photo, there are three figures in the background; one is a senior officer talking to two soldiers. The officer has three rings on his sleeve and is either a Major, a Lt. Colonel, or a Colonel; I'm afraid that I cannot be sure which, as I cannot see the cuff on his sleeve; as one button would indicate a Major, two a Lt. Colonel, and three a Colonel. He is leaning on his swagger stick and has a binocular case attached to his 'Sam Brown' belt. The gentleman wearing the darker uniform with the highly polished peak to his cap is a Royal Engineer Staff Sergeant; note the soldier immediately to his right wearing his hat at a very jaunty angle. The soldier in the right foreground behind the stone revetted traverse leaning with both hands on his shovel has a jack knife hanging from his belt, as does the soldier in the far left background who is bending over digging. The three Royal Engineers in the right foreground with sailors' jumpers on, may indicate that the Royal Engineers come from a Submarine Mining Company; the nearest then being Pennar Barracks, Pembroke Dock.



## **2.4 Contemporary Photographs and LiDAR**

### **Area [1] Penally Practice Trenches**

- 2.4.1 The practice trenches have been the subject of many aerial surveys, most frequently by staff from the Royal Commission on Ancient and Historic Monuments of Wales (RCAHMW); staff from the Commission photograph Scheduled Monuments from the air on behalf of Cadw, as part of a routine monitoring programme. These aerial photographs have helped to demonstrate the complexity of the trenches and highlight features within them which are discussed below (Fig. 20). They have also been a key source for assessing the condition of the monument.
- 2.4.2 Google Earth also provides a sequence of vertical aerial photographs from 2006, 2009, 2018, 2020 which demonstrate in particular the encroachment of bracken on the eastern section of the monument in the 21<sup>st</sup> century.
- 2.4.3 LiDAR coverage is available at 1m resolution for the trench system (Fig. 21) which gives a clear depiction of the depths of the trench system and the extent of the earthworks, including an oval circuit of trenches behind the lines, interpreted as a redoubt and to the west of this an area of disturbed ground which may be a further redoubt.

### **Area [2] Penally Training Area**

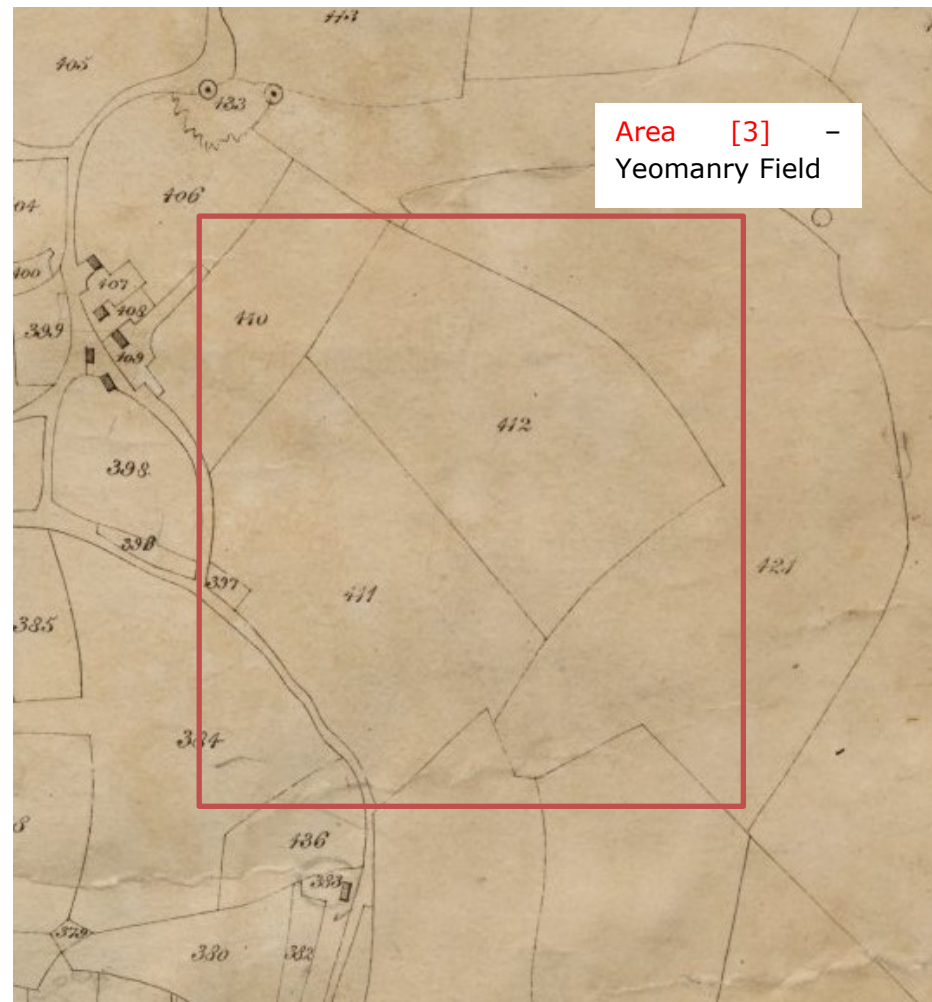
- 2.4.4 Area [2] Penally firing range is captured by Google Earth from 2006, 2009, 2018, 2020 and 2021; these images do not clearly indicate the location of the trenches visible on the wartime photography, but demonstrate that the area has been under rough vegetation for some time.
- 2.4.5 LiDAR coverage of this area does not give any indication of the preservation earthworks in this area.

### **Area [3] Yeomanry Field**

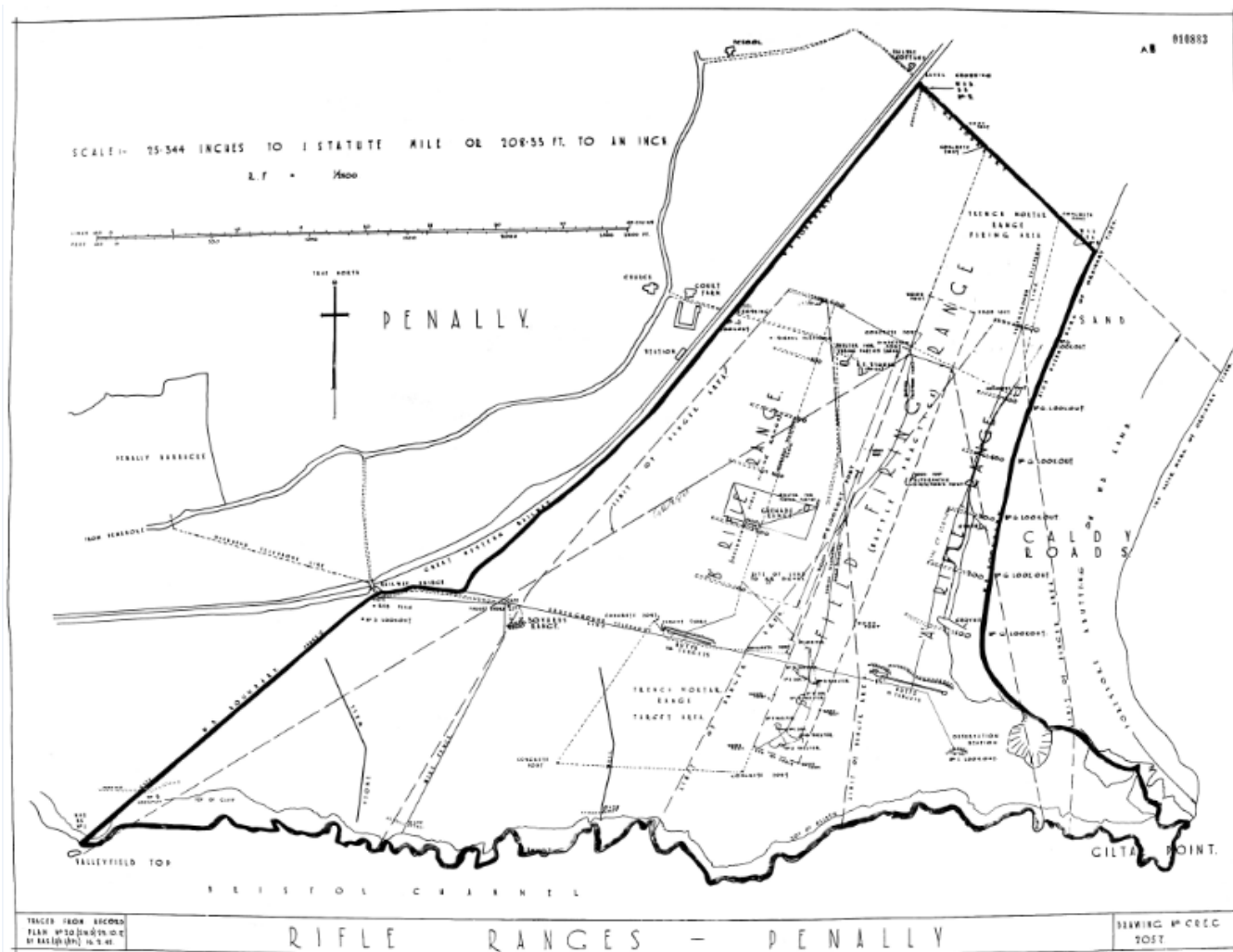
- 2.4.6 Yeomanry field has been subject to agricultural improvement which has effectively levelled the ground surface, however a Google Earth image taken in the dry summer of July 2018 shows a sub-rectangular feature aligned northwest by southeast (Fig. 22).
- 2.4.7 1m LiDAR does not appear to show any indication of this feature.



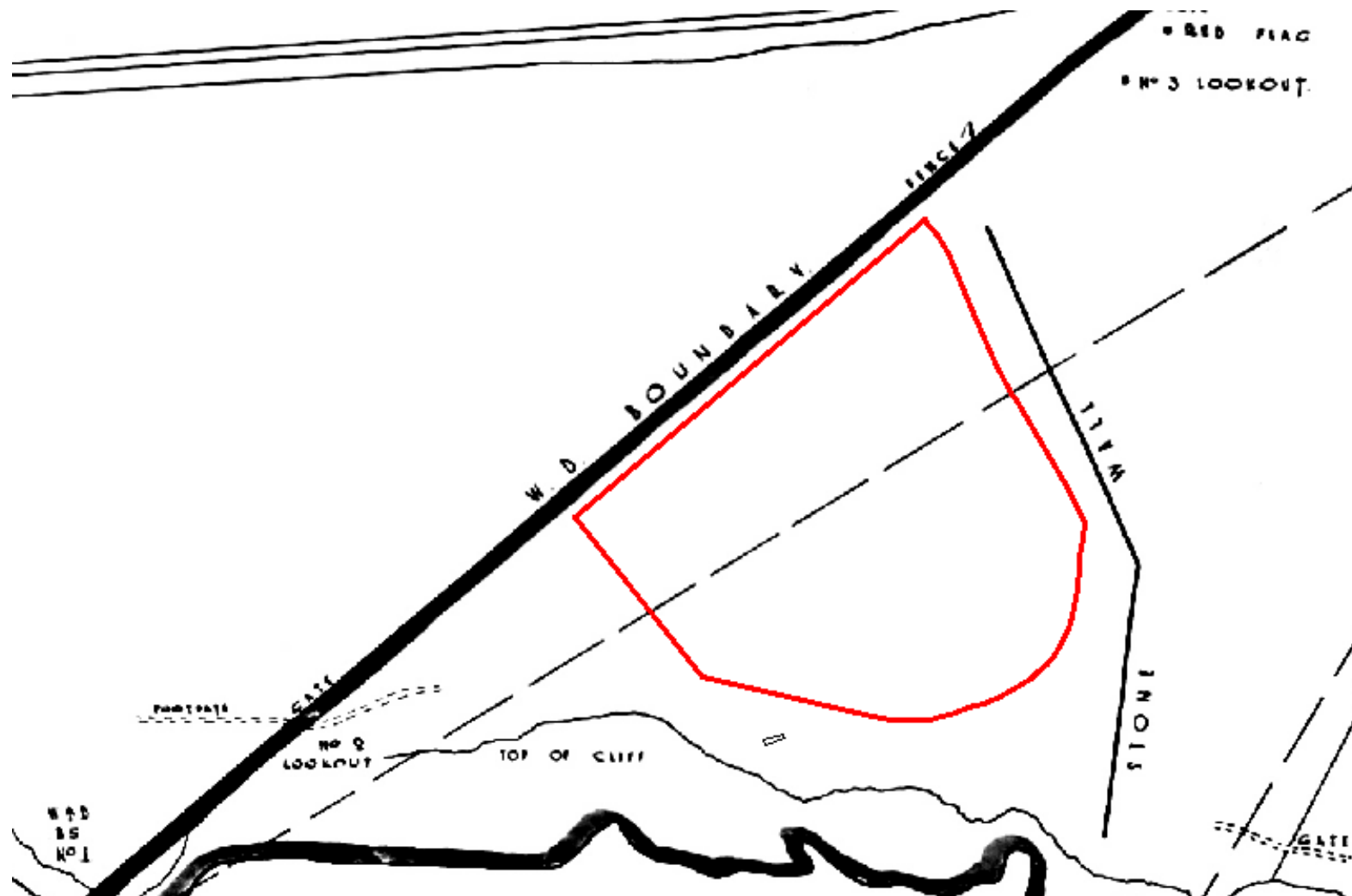
**Figure 7:** Penally Parish Tithe Map (1842), Crown Copyright images reproduced by permission of The National Archives, London, England.



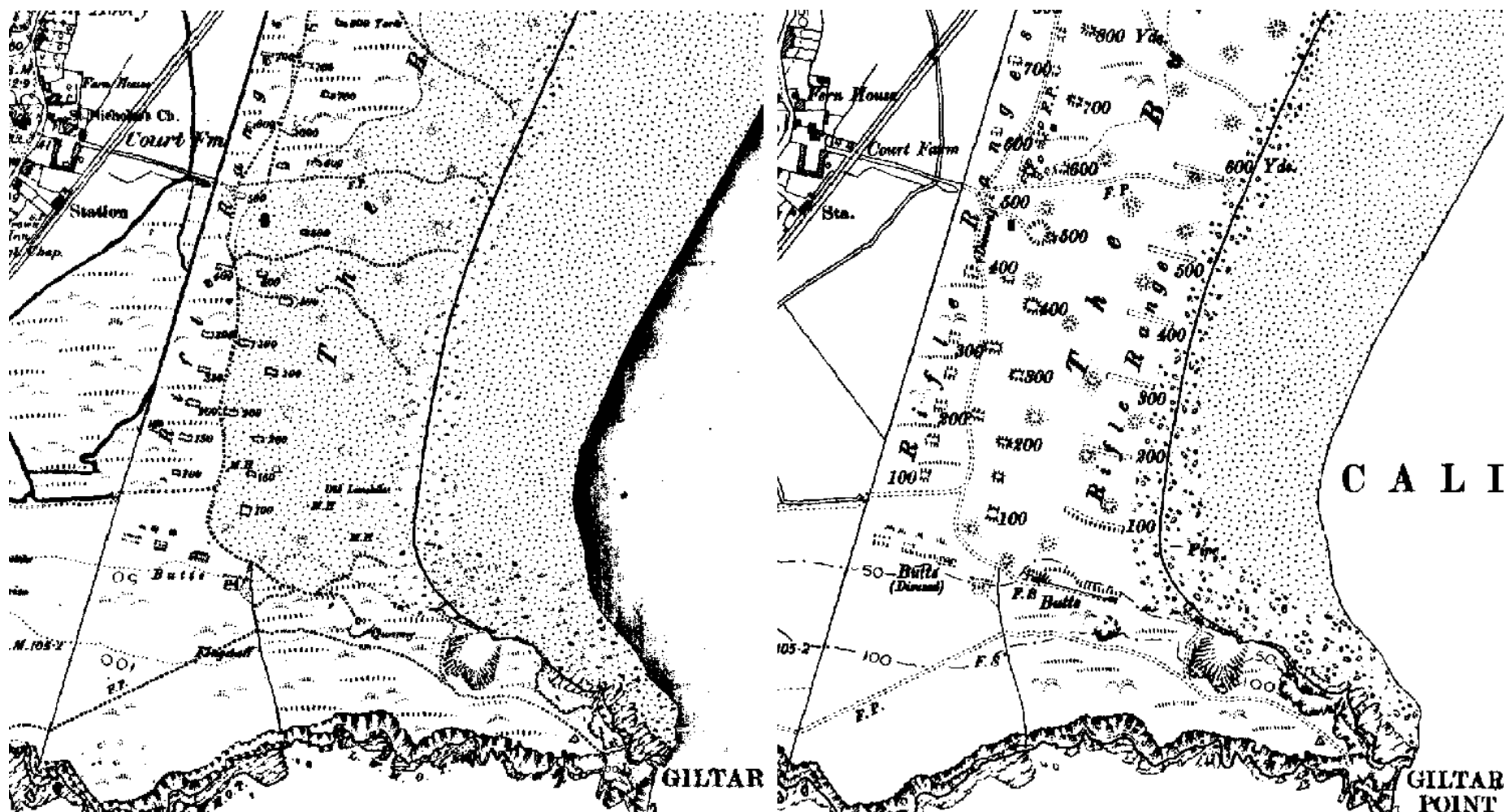
**Figure 8:** Detail of Penally Parish Tithe Map (1842), Crown Copyright images reproduced by permission of The National Archives, London, England.



**Figure 9:** Plan traced from 1917 Record plan and annotated in 1945 (MoD).

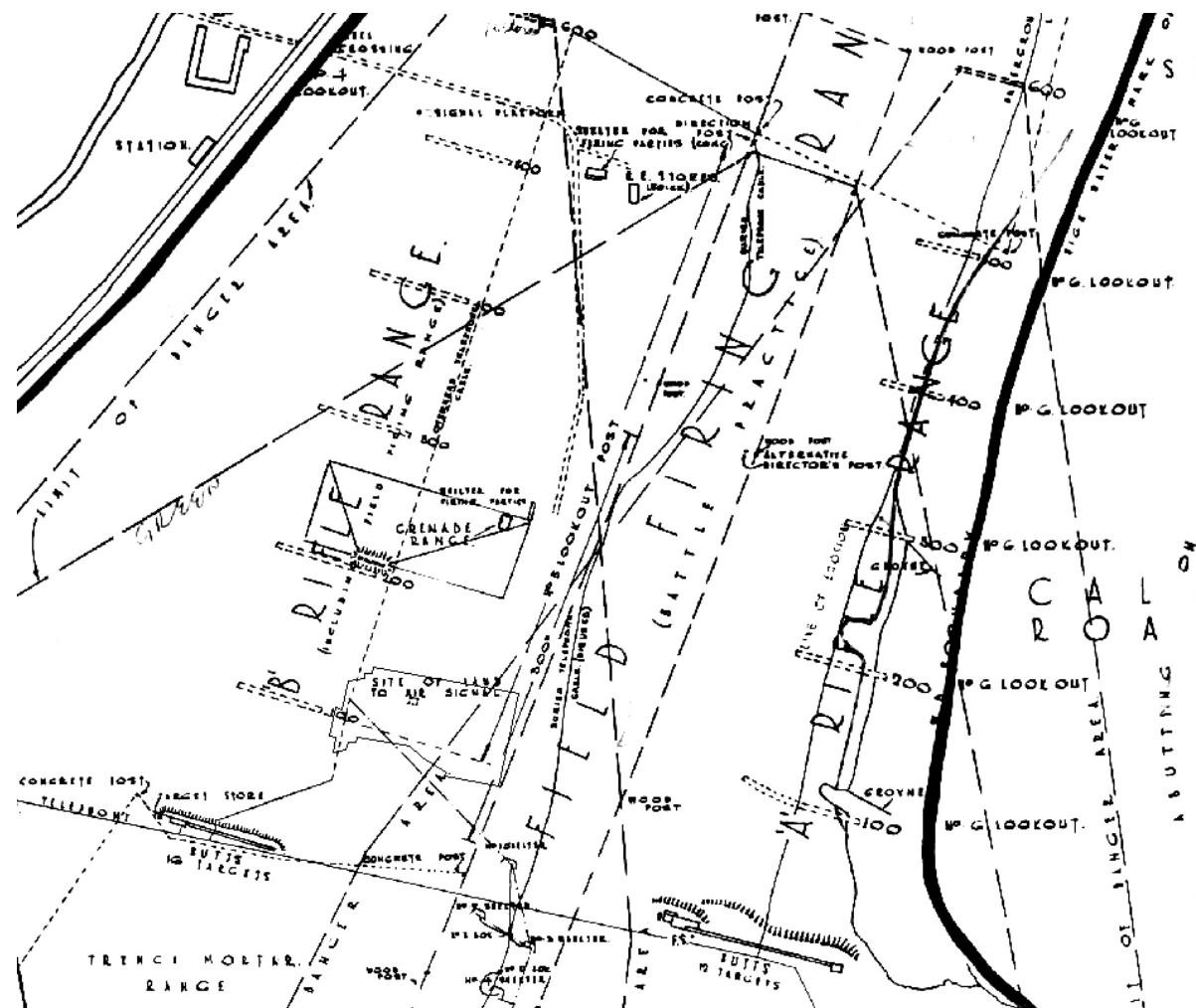


**Figure 10:** Extract of Plan traced from 1917 Record plan and annotated in 1945 (MoD) scheduled area in red.



**Figure 11:** The first and second edition Ordnance Survey maps 1889 and 1908.





**Figure 12:** Extract of Plan traced from 1917 Record plan and annotated in 1945 (MoD).



**Figure 13:** Vertical aerial photograph, RAF 8<sup>th</sup> July 1946 (Welsh Government 4642 106G UK 1629 4118).



**Figure 14:** 1951 Vertical aerial photograph of Penally practice trenches 5101 58RAF670 4047 (Roger JC Thomas).





**Figure 15:** Vertical aerial photograph of Penally practice trenches 23 September 1964 OS64\_209 175 6417 (Roger JC Thomas).



**Figure 16:** Historic photograph of Penally range looking south to the targets (David Glennerster).





**Figure 17:** Penally range looking northwards in the late 1890s or early 1900 earlier firing points can be seen (David Glennerster).



**Figure 18:** 1940 aerial photograph of Penally range looking northwest (Welsh Gov, MWO 16 C1).





**Figure 19:** Yeomanry or Volunteers Field, Penally 1926 (Roger JC Thomas).



**Figure 20:** 2006 Aerial photograph of Area 1 practice trenches from the northeast. (Image AP\_2006\_ is Crown copyright and is reproduced with the permission of the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW), under delegated authority from The Keeper of Public Records).



**Figure 21:** Area 1 Practice trenches LiDAR resolution 1.0m (NRW Open Government Licence)



**Figure 22:** Area 3 – Google Earth July 2018.

### **3. GEOPHYSICAL SURVEY METHODOLOGY**

#### **3.1 Data Collection**

- 3.1.1 The survey was conducted using a Bartington-601 fluxgate gradiometer with two sensors at 1m spacing and with a DL601 data logger. The gradiometers sensitivity was set to detect a magnetic variation in the order of 0.1 nanoTesla (nT).
- 3.1.2. Data was collected within a controlled grid that was physically marked out on the ground to within 0.1m+/- accuracy. The survey grid was tied into the local Ordnance Survey (OS) grid using a Trimble R8s integrated GNSS system with TSC3 controller.

#### **3.2 Ground Coverage**

- 3.2.1 In each area an attempt was made to survey as large of an area as possible. In most instances this was constrained by external influences that would have an adverse effect on the survey data (typically modern features such as metal chain-linked fences, roads, etc). To minimise the impact such features would have on the survey results it was necessary to keep a distance of up to 5m away from them.

#### **3.3 Resolution**

- 3.3.2 Data was collected in 30m x 30m grids using the zigzag traverse method with a sample interval (x-axis) of 0.25m (four readings per metre) and a line separation (y-axis) of 1m.

#### **3.4 Data Processing**

- 3.4.1 The data was processed using *Terrasurveyor 3.0.36.1* and is presented with a minimum of processing.
- 3.4.2 Typically the data is "de-striped" to remove any striping effect that is caused by an imbalance between the two sensors. It is then "clipped" to remove the presence of high values caused by ferrous objects which tend to hide fine details and obscure archaeological features, allowing finer details to show through.
- 3.4.3 Other processing functions may include "de-staggering" the data. This is to correct line displacement errors caused by variations in the traversal rate resulting in the sensors being in the incorrect position when taking a reading. Finally, the data may be "interpolated" followed by a "low pass filter". The gradiometer collects readings every 0.25m along the transect (x-axis) and 1.0m (or 0.25m in the higher resolution surveys), this results in an imbalanced grid, so by interpolating the data and choosing to match the x and y-axis by an increased factor the grid becomes more balanced. The "low pass filter" is used cautiously to smooth the data without removing any archaeology

#### **3.5 Data Presentation and Interpretation**

- 3.5.1 Data is presented with a minimum of processing as a grey-scale plot overlaid on local topographical features. The main magnetic anomalies have been identified using a combination of the grey-scale plots at different stages of processing and XY traces which aid in interpretation by allowing for visualisation of the magnitude and form of a geophysical anomaly.
- 3.5.2 The results have been compared to available sources (satellite imagery, aerial photographs, historic maps etc.) to increase confidence levels and an interpretation of the results has been formulated. In some instances, it is possible to provide a very specific interpretation to geophysical anomalies i.e. where its character or form is well documented, its existence was known about before the survey, or corroborative

evidence can be found. In other cases, a broader categorisation of interpretation is required. Often, looking at the results as a whole and the environs within which they sit provides greater context and aids in the interpretation of individual features.

### **3.6 Dates of Fieldwork**

- 3.6.1 The geophysical survey of Areas 1 and 2 was undertaken over 5 days from 13<sup>th</sup> to 17<sup>th</sup> May 2019 inclusive. Area 3 was surveyed, with the help of volunteers during the 3-week period from 3<sup>rd</sup> to 21<sup>st</sup> June 2019.



## **4. EXCAVATION METHODOLOGY**

### **4.1 Fieldwork Methodology**

- 4.1.1 All three areas had the potential to retain explosive ordnance; therefore, it was necessary to liaise with DIO to assess any risks. The risks were considered low and every staff member and volunteer was instructed on the identification of ordnance and what procedures should be followed if ordnance was discovered. These procedures were adhered to wherever work was being carried out.
- 4.1.2 The results of the geophysical survey were used to target the location of excavation trenches in all areas.
- 4.1.3 All excavation on the MoD estate was done using hand tools. Turf was set to one side on plastic sheeting, separate from other excavated material. At the end of the excavation the trenches were backfilled by hand and turf carefully replaced.
- 4.1.4 The trenches were appropriately excavated to an appropriate level to prove the presence or absence, of archaeological features and to determine their significance. The trenches were surveyed using accurate GPS or Total Station.
- 4.1.5 All deposits were recorded by archaeological context record sheet, scale drawing, photography and site notebooks. All individual deposits were numbered using the open-ended numbering system in accordance with DAT Archaeological Services' Recording Manual<sup>3</sup>. Significant deposits were recorded by scale drawing (no less than 1:20); drawn plans were related to Ordnance Datum and, where possible, known boundaries. A photographic record was maintained using high resolution digital photography.
- 4.1.6 All archaeologically significant artefacts, ecofacts and samples were retained and, where possible, related to the contexts from which they derived. Sensitive material was stored in appropriately stable conditions. Finds were temporarily stored by in stable conditions. All finds, except those deemed to be Treasure<sup>4</sup>, remained the property of the landowner, but it is assumed that permission has been given by the landowner for these to be stored as part of the archive in a suitable repository (ownership will still be with the landowner).
- 4.1.7 Under the 1996 Treasure Act, "treasure" can be summarised as:
- Any object other than a coin containing at least 10% gold or silver and at least 300 years old;
  - Any prehistoric assemblage of base metal;
  - Coins found together which contain 10% gold or silver (but no single coins) and groups of at least 10 coins of other metals, provided they are at least 300 years old;
  - Any object found associated with treasure except unworked natural objects; and
  - Any object which would have been Treasure Trove before the 1996 Act but not covered above.
- 4.1.8 The excavations were undertaken over a 3-week period from 3<sup>rd</sup> to 21<sup>st</sup> June 2019.

---

<sup>3</sup>. DAT Archaeological Services use the Recording Manual developed by English Heritage Centre for Archaeology. A copy will be available for inspection if required.

<sup>4</sup> If any material deemed to be Treasure is found, the Coroner must be informed



## **4.2 Post-Fieldwork Reporting and Archiving**

- 4.2.1 All data recovered during the fieldwork was collated into a site archive structured in accordance with specifications in *Archaeological Archives: a guide to best practice in creation, compilation, transfer and curation* (Brown 2011), and the procedures recommended by the National Monuments Record, Aberystwyth.
- 4.2.2 The results of the fieldwork have been assessed in local, regional and wider contexts. The report includes a desk-based research element to ensure that the site is placed within its wider archaeological context.

## **5. GEOPHYSICAL SURVEY RESULTS**

### **5.1 Area 1 Penally Practice Trenches**

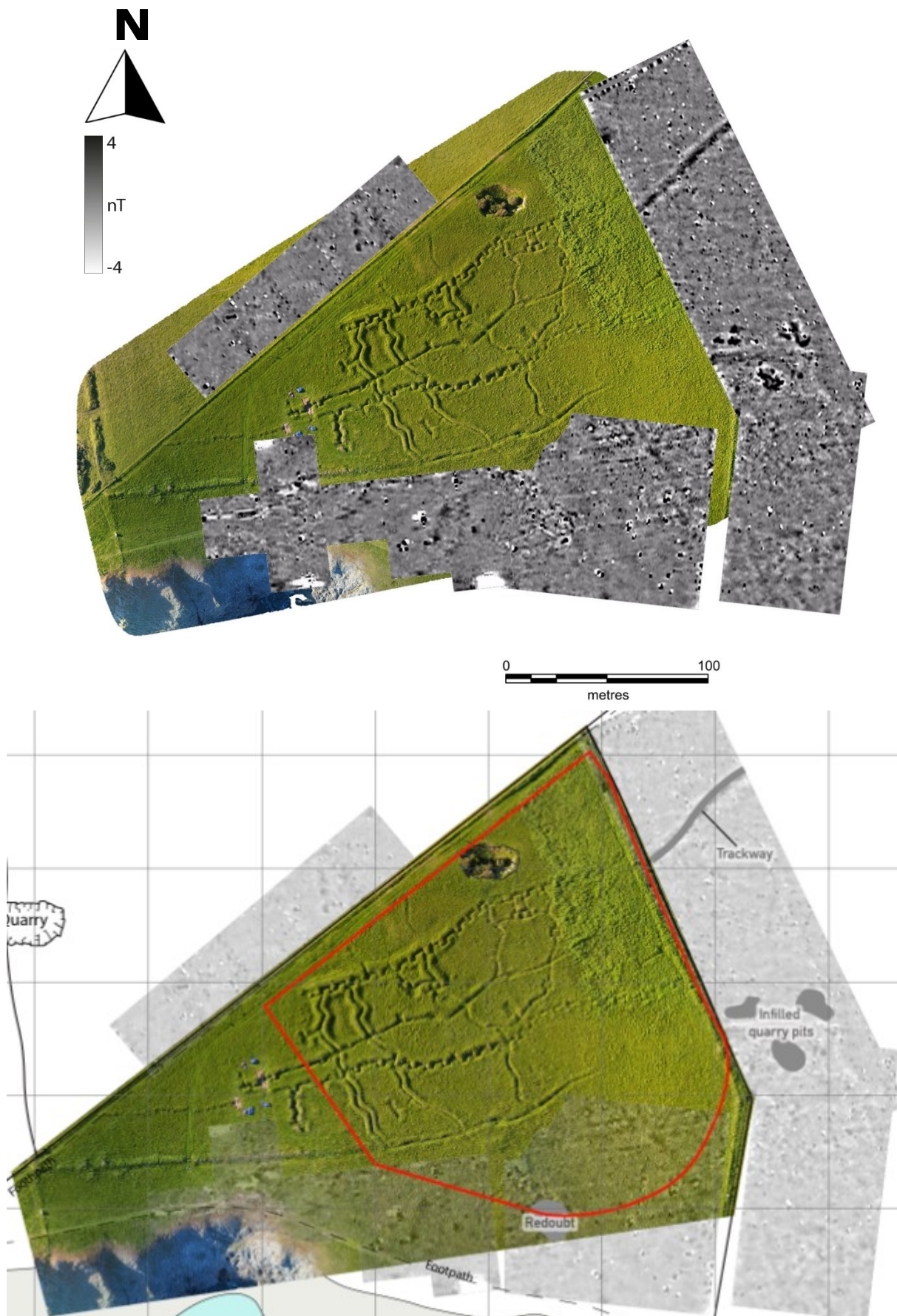
- 5.1.1 The results of the geophysical survey in Area 1 showed no evidence that the practice trenches extended beyond into the fields to the north and east (Fig. 23).
- 5.1.2 The High Command Redoubt can be clearly seen to the south and evidence of the continuation of the 1<sup>st</sup> line of trench to the west (Fig. 23).
- 5.1.3 The only other features identified in the results include a former trackway to the northeast which is not visible on the surface nor does it appear on the LiDAR (1m resolution) and a scattering of former small quarry sites.
- 5.1.4 Geophysical survey does not support the potential second redoubt to the south of the trenches.

### **5.2 Area 2 Penally Training area**

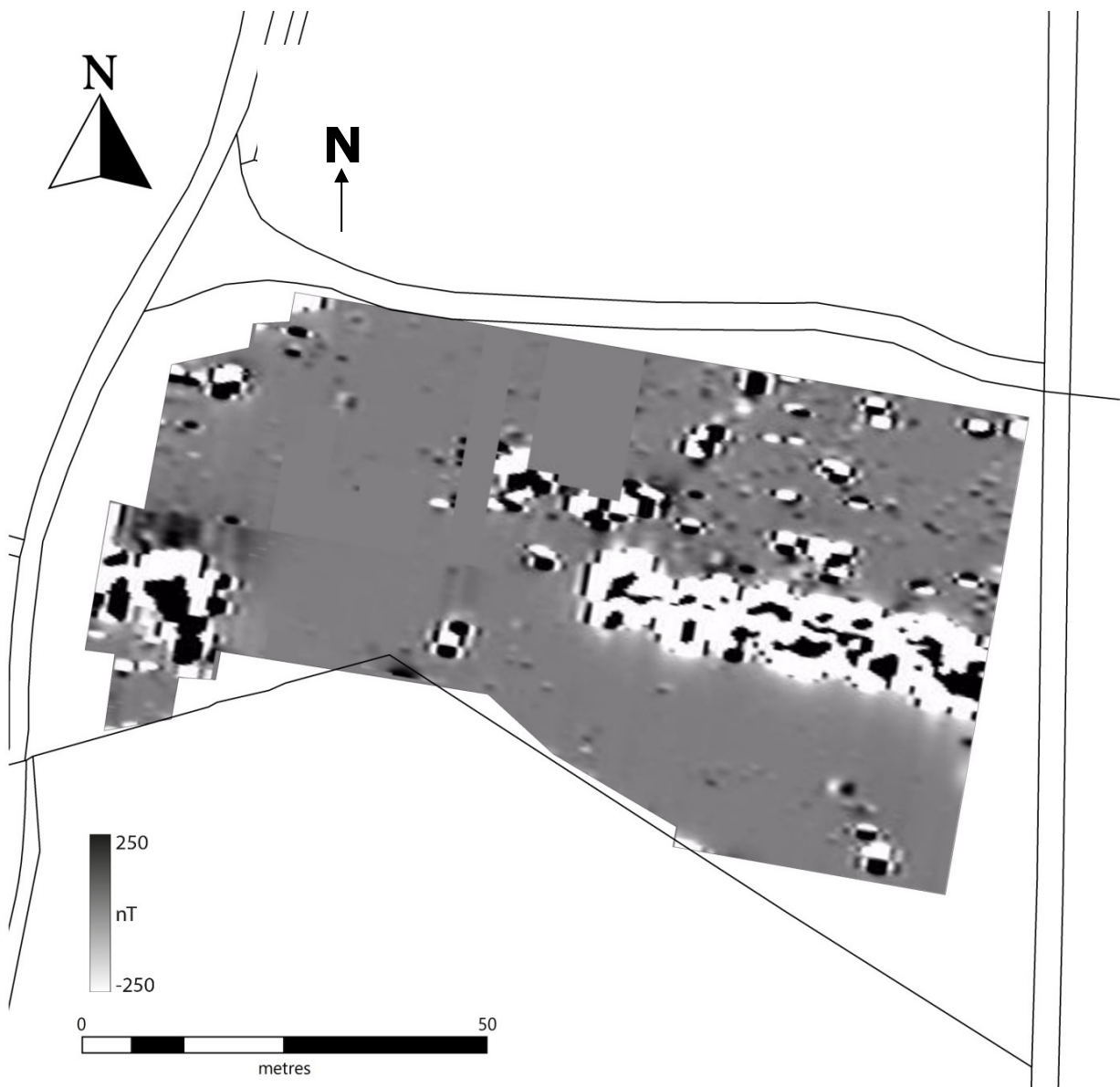
- 5.2.1 The geophysical survey in Area 2 targeted the evidence for a dog toothed practice trench seen in a 1941 aerial photograph of this area (Fig. 4).
- 5.2.2 The survey results (Fig. 24) show a large linear anomaly extending from the edge of the golf course to the east that abruptly ends in the centre of the small field. The anomaly measured approximately 50m long and 10m wide. The high positive and negative responses of the feature indicated it was made of ferrous metal, and was associated with the practice trenches identified in this area. It was suggested that the trenches could have been constructed from corrugated metal sheeting.
- 5.2.3 In the southwest corner of the survey area a similar anomaly appears to be just encroaching into the survey area and probably extends westwards beyond the area surveyed.
- 5.2.4 Several other high magnetic responses were recorded across the field but there was no observable form to them and they may be a consequence of random ferrous objects or artefacts spread across the area.

### **5.3 Area 3 Yeomanry Field**

- 5.3.1 Geophysical survey in the field situated east of the current by-pass (A4139) identified a number of features, including a modern service pipe running across the field. Of greater interest was a rectangular feature that corresponded to an area of rougher disturbed ground within the field (Fig. 25). The rectangular feature measured approximately 15m by 35m, the ditch appears to be up to 2m wide. There are signs of subsidence on the surface in this area suggesting the collapse of a subsurface structure. Lying to the southeast was a cluster of small anomalies that could be caused by small ferrous objects buried within the soil and may represent associated artefacts.
- 5.3.2 Geophysical survey was also carried out on the playing field on the western side of the bypass (Fig. 26). The results did not show any evidence of significant archaeology. A modern utility runs through the centre of the survey area and another one along the southern edge. There is no evidence to suggest that the large dipoles are archaeological artefacts.
- 5.3.3 Ground penetrating radar survey was carried out by a volunteer Tim Fletcher and clearly shows the rectangular feature in further detail (Figs 27 and 28).

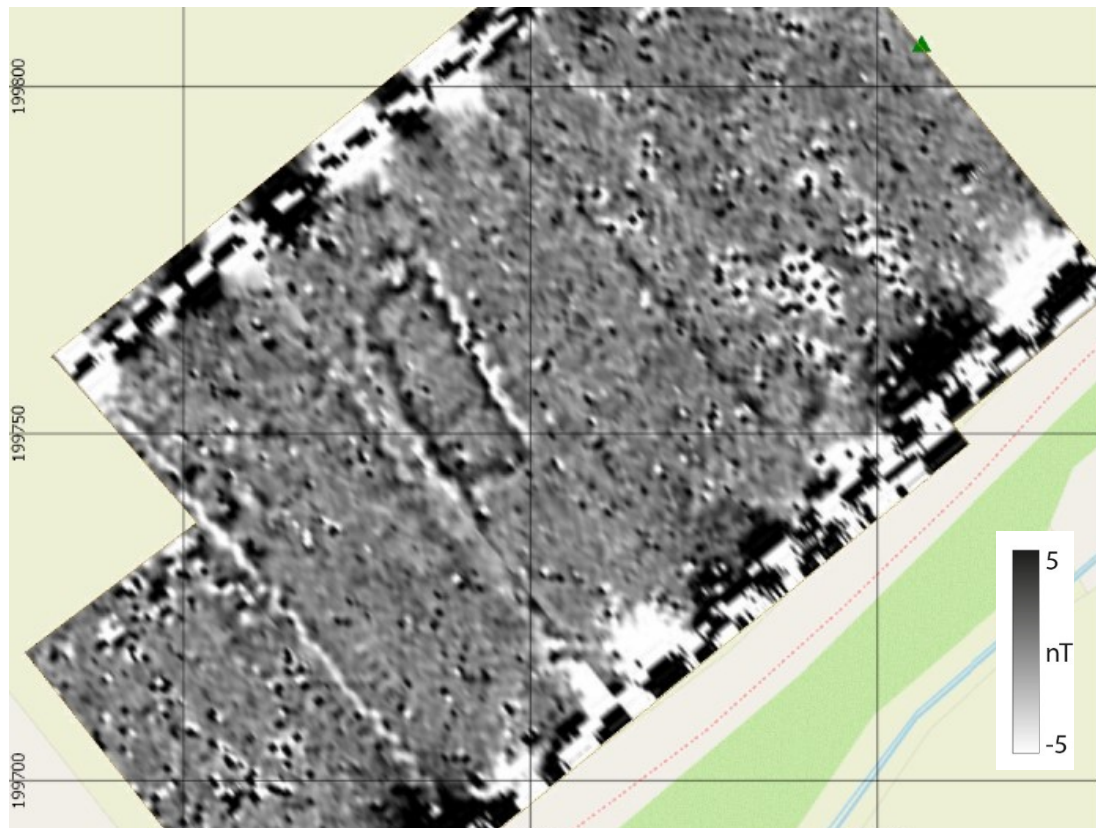


**Figure 23:** Geophysical survey greyscale results in Area 1 above and interpretation plot with orthomosaic below.



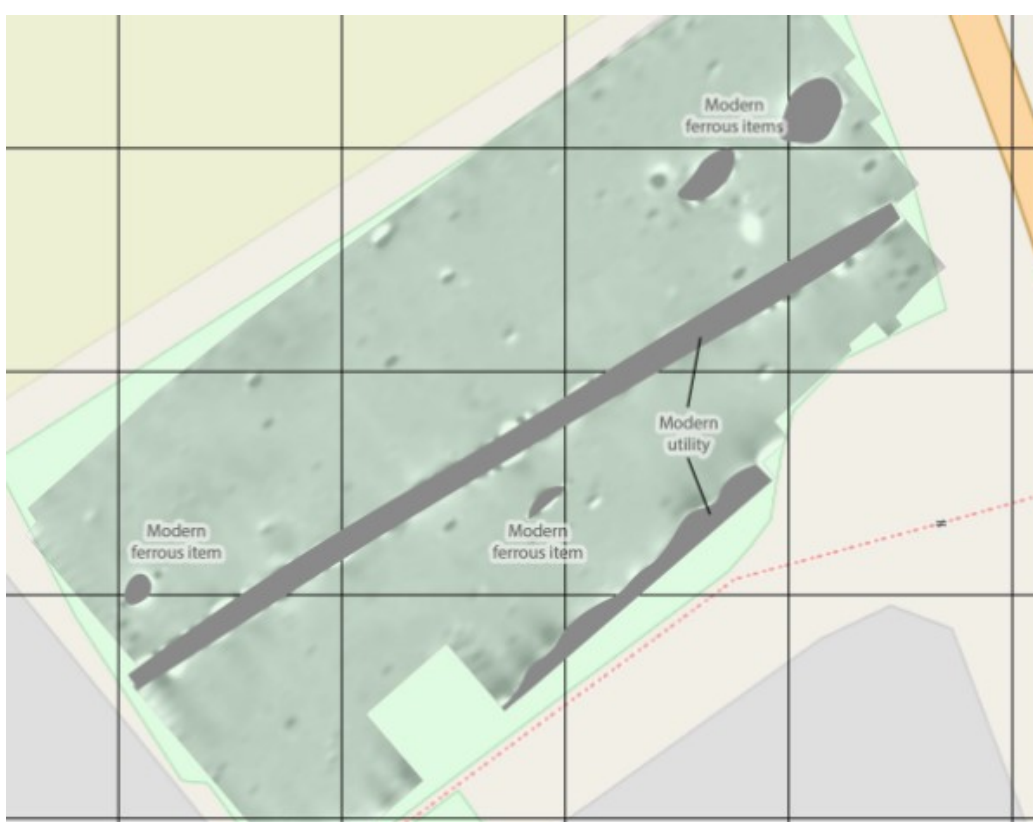
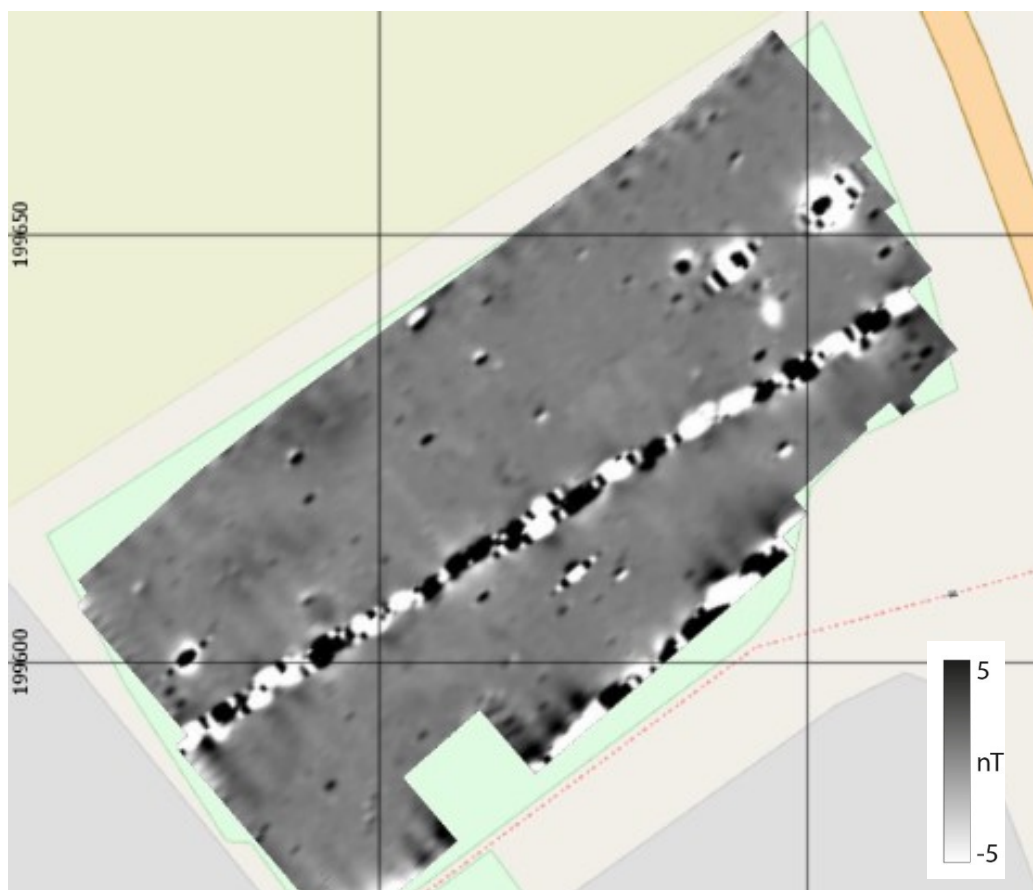
**Figure 24:** Geophysical survey greyscale results in Area 2.





**Figure 25:** Geophysical survey greyscale results in Area 3 east of the bypass; and interpretation plot below.

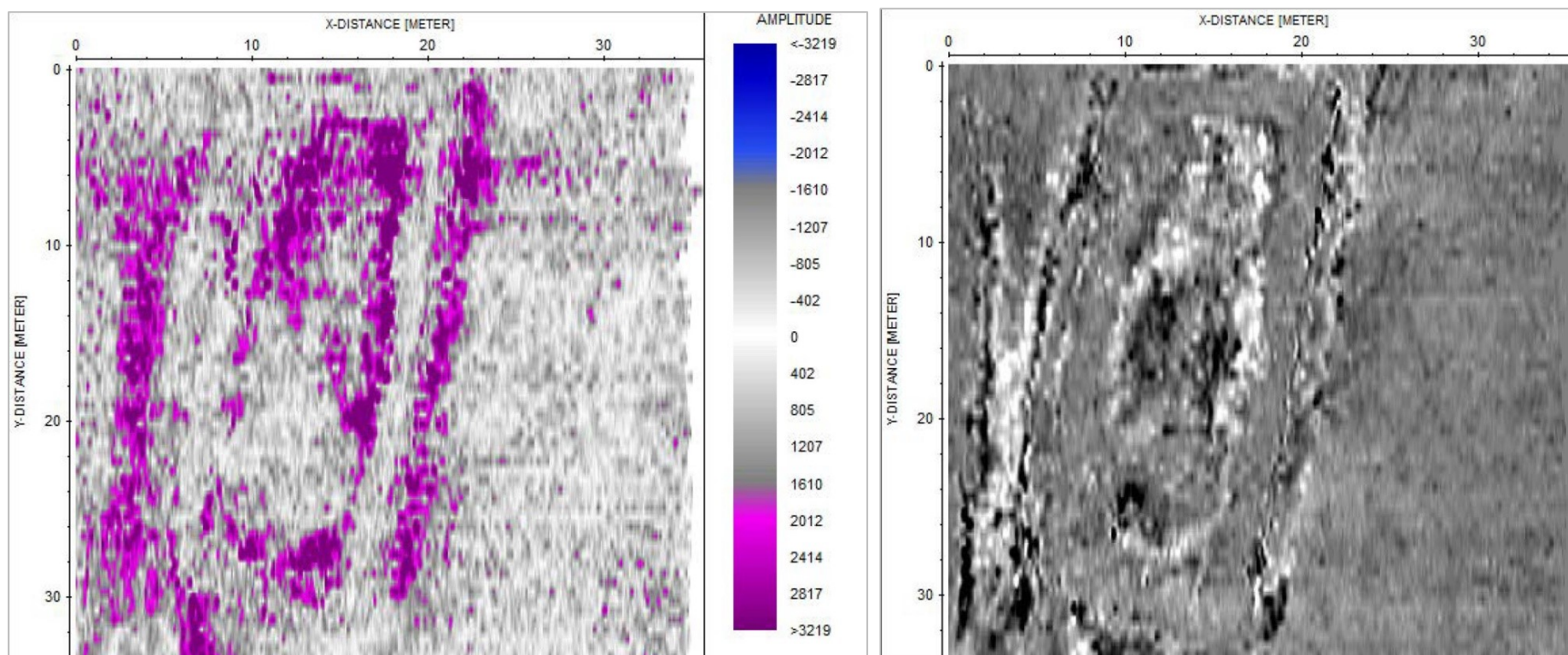




**Figure 26:** Geophysical survey greyscale results in Area 3 west of the bypass; and interpretation plot below.



**Figure 27:** Results of the ground penetrating radar survey that was carried out in the area of the rectangular structure recorded during the geophysical survey (Tim Fletcher, Geoscope).



**Figure 28:** Detailed results of the ground penetrating radar survey showing possible evidence for surviving buried remains of the practice trenches (Tim Fletcher, Geoscope).



## **6 EXCAVATION RESULTS**

### **6.1. Four trenches**

- 6.1.1 In total four trenches were opened (Fig. 29). Initially two trenches were opened in Area 1 to the west of the scheduled area, targeting the fire trench, and possible pits (Trenches 1 & 2). Simultaneously a trench was opened in Area 2 Penally Training area to target the strong geophysical anomaly that was believed to be a corrugated metal practice trench (Trench 3). Subsequently a further trench was opened in Area 1 to investigate a hollow forward of the fire trench (Trench 4). The trenches were recorded with plan and section drawings where appropriate.
- 6.1.2 Turf was removed by hand and stacked on sheeting to protect the ground surface and a plan was drawn prior to excavation.
- 6.1.3 See Table 2 for a list of excavated contexts.

### **6.2 Area 1 Penally Practice Trenches**

- 6.2.1 Trench 1 was 3m wide and 8.6m long stretching across the trench and upcast either side (Figs 30-32, Photos 4-9).
- 6.2.2 Excavation revealed substantial amount of homogenous slumped bank material composed of friable sandy silt (105).
- 6.2.3 The parapet (the bank to the north) was possibly slightly more stony.
- 6.2.4 A structure interpreted as the slight remains of stone edging or revetting was identified with three medium sized stones in a line (104).
- 6.2.5 A couple of sections were cut across the trench to try and identify the base and edges.
- 6.2.6 Initially the edge of the trenches where difficult to identify, given that the backfill was similar to the underlying subsoil. However the base of the trench was confirmed when the rock cut bottom was revealed on the west side of the trench. The base was cut into rock by c. 50mm.
- 6.2.7 The dog leg or return of the fire bay was revealed on the west side of the trench, where the base of the trench was cut into rock.
- 6.2.8 The width of the base of the trench varied between 0.55-0.60m, which corresponds with the dimensions (2 feet) in the manuals of the time (Notes for Infantry Officers on Trench Warfare, 1916), it was generally around 0.6m deep.
- 6.2.9 A large section of corrugated metal sheeting (not *in situ*) was revealed that had apparently slumped in from the side of the trench or possibly part of a cover or roof to a recess in the rear, southern side of the trench. The excavation trench was widened by an additional metre to reveal the whole of the metal sheeting (Photo. 4).
- 6.2.10 A recess, 0.90m wide by 1.04m deep, had three vertical wooden stakes along either side, one stake remaining in the rear face, but also the space for another which may have already decayed. At its base was an metal sheet or tray 0.83m wide and 0.98m deep (Fig. 32, Photos 5-8). To the front of this was a wooden cill. The metal plate was slightly concave at its base and when removed was shown to have a lip around the edge.

- 6.2.11 It was noted that in excavating the recess the backfill was very sandy, suggesting that sandbags had been used or had slumped into it.
- 6.2.12 Trench 2 was 2.5m wide and 5m long and located to investigate a second supervision/support trench which runs parallel but south of the first trench and was marked only by an earthwork line of depressions extending to the west (Figs 33 and 34, Photo. 10).
- 6.2.13 Stripping off the topsoil revealed a couple of deposits of stony material and in the foreground these orangey patches, which were not burnt stone or earth, but perhaps turves.
- 6.2.14 Excavation revealed a section of a pit, 0.66m deep, 1.40m in diameter. The pit bottomed out onto a bedrock base.
- 6.2.15 A further exploratory slot was cut against the eastern section in which a further pit (0.66m deep x 0.80m wide) and a linear trench running east-west (0.55m deep x 0.64m wide), which may have been a trench connecting interspersed pits. These were impossible to see in plan and were only picked up in section
- 6.2.16 This seems to represent different phases of activity happening within quite short spaces of time.
- 6.2.17 Trench 4 was 1.5m wide and 2.6m long and positioned to put a section through a depression which lies forward of the trench (Fig. 35, Photos 11 and 12).
- 6.2.18 A deep, steep sided pit was discovered which was cut through the natural-weathered/degrading limestone bedrock. The natural bedrock appeared to be flattened to the north creating a 'shelf'. In the south section a cut is visible creating an entrance to the pit from the main trench system located to the south.
- 6.2.19 This would fit the description and the location of a forward machine gun post, with a platform for a machine gun tripod and just one or two men in the pit.

### **6.3 Area 2 Penally Training Area**

- 6.3.1 Trench 3 was 2.15m wide and 10.4m long and positioned to cross-section the geophysical anomaly that indicated ferrous material and the suggested practice trench on the aerial photographs (Figs 36-38, Photos 13-16).
- 6.3.2 Excavation was characterised by fill which comprised of various lenses of windblown sand.
- 6.3.3 At the south end of the trench a traverse was revealed with shuttered corrugated metal sheeting which revetted the trench sides, with vertical wooden stakes positioned within the trench to support the metal sheets – the stakes survived as stake-holes, some wood still surviving.
- 6.3.4 A railway sleeper was positioned on the inside of the northern trench side, possibly providing a bench or step.
- 6.3.5 Coiled wire was also used to pin back the corrugated metal sheeting.
- 6.3.6 The traverse or fire bay extended to the east of the southern end of the trench; the corrugated metal sheeting had been lost, but the cut of the trench could still be observed within the sand, suggesting the sheeting had been removed before being infilled. Remnants survived in the east section.



- 6.3.7 The corrugated sheeting had been inserted into natural sand.
- 6.3.8 Towards the north end of Trench 3 at a depth of 1.30m a brown stain was observed 0.6m x 2.10m running across the trench, cutting the natural sand, it was very thin and easily trowelled away. It suggested the remains of wooden plank laid which had since decayed.
- 6.3.9 At the north end of the trench a stone bank (304) 0.40m high and at least 1m wide (full the north edge was not established as it lay beyond the limit of the excavation). This would indicate a stone constructed firing point, which may have been covered in sandbags or turves, though these have long gone. The trench when cross referenced with the 1<sup>st</sup> edition Ordnance Survey map clips the 100 yard firing point.

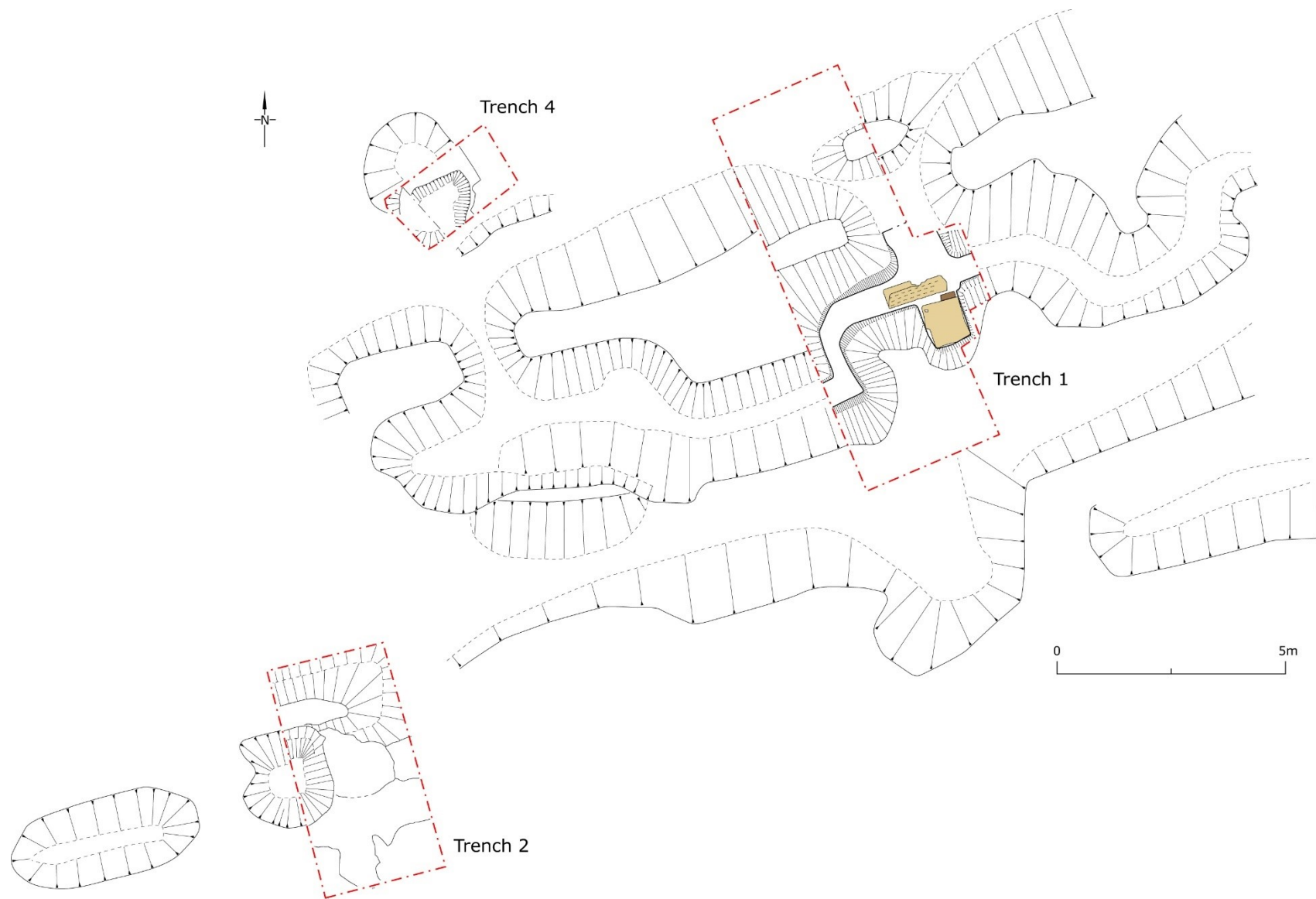
Next page – **Table 2:** List of excavation contexts.

Context Nos	Type of context	Context descriptions	Relationship
101	Deposit	Topsoil, dark brown silty sand	Overlies 106
102	Deposit	Remains of bank material comprising of a dark brown silty clay, which contains frequent small sub angular stone inclusions	Overlies 103
103	Deposit	Remains of bank material comprising of a of a mid to dark brown silty clay which contained moderate inclusions of small sub angular stones	Underlies 102
104	Structure	Slight remains of stone edging/revetment formed by three medium sized sub angular stones laid in a line	Part of 103
105	Deposit	Friable dark brown sandy silt. Probably remains of back fill which is found throughout the practice trench	
106	Deposit	Subsoil, Friable light-mid brown sandy silt	Underlies 101
201	Deposit	Geological Natural- Red clay and weathered limestone	
202	Cut	Cut of pit within southern end of investigational sondage	Cuts natural 201
203	Cut	Cut of pit within northern end of investigational sondage	Cuts natural 201
204	Deposit	Topsoil- Loosely compressed dark brown silty sand which contains rare small sub angular stones and occasional pieces of coal	Overlies 205
205	Deposit	Subsoil- Light to mid brown sandy silt	Underlies 204
206	Deposit	Dark brown silty clay	Fill of pit 203
207	Deposit	Dark brown silty clay	Fill of pit 202
208	Deposit	Reddish brown silty clay interface	Overlies natural 201 and underlies subsoil 205
209	Cut	Rifle pit/ fox hole	Contains fills 213, 212, 211, 210 and has cut through subsoil 205 and topsoil 204
210	Deposit	Friable mid dark brown silty sand with occasional small patches of red clay up cast. Also contains two medium sized sub angular stones	Overlies 211
211	Deposit	Friable light-grey brown silty sand which contains several medium to large sized sub angular limestones. Also contains occasional small patches of red clay up cast	Overlies 212
212	Deposit	Friable mid grey brown silty sand which contained a single large sized sub angular limestone and occasional small pieces of coal. A single Lee Enfield .303 cartridge was also found within this deposit	Overlies 213
213	Deposit	Friable mid brown silty sand with occasional small patches of red clay up cast	Underlies 212
301	Deposit	Topsoil- loosely compacted light greyish brown silty sand	Overlies 302
302	Deposit	Brownish grey sand	Overlies 303
303	Deposit	Yellowish sand	Overlies 306

304	Deposit	Firm grey sand	Overlies 326
305	Deposit	Dark grey/ black sand	Underlies rubble deposit 325
306	Deposit	Loosely compacted mottled brown/yellow/grey sand	Overlies 305
307	Deposit	Compacted off white/grey sand	Overlies 308
308	Deposit	Loosely compacted yellow sand	Overlies 311
309	Deposit	Loosely compacted yellow/off grey/ white band of sand	Overlies 310
310	Deposit	Loosely compacted brownish/ginger band of sand	Underlies 309 and 307
311	Deposit	Loosely compacted off yellowish sand	Overlies 312
312	Deposit	Same as/similar to (310)	Overlies 309
313	Deposit	Patch of small shattered slates	Overlies 322
314	Deposit	Lens of yellow sand possibly associated with adjacent cables	Overlies 312
315	Deposit	Yellow sand lens associated with cables	Overlies 312
316	Deposit	Lens of yellow sand	Overlies 317
317	Deposit	Yellow/grey mottled sand	Overlies 309
318	Deposit	Superficial geology- Yellow/white sand	Underlies 323
319	Deposit	Firmly compacted grey sand	Overlies 323
320	Deposit	Firmly compacted creamy yellow lens of sand	Overlies 319
321	Deposit	Loosely compacted brown sand	Overlies 320
322	Deposit	Yellow sand	Backfill of practice trench cut 324
323	Deposit	Dark yellow sand	Overlies 318
324	Deposit	Cut edge of practice trench produced by previous sheet of corrugated Iron sheeting (visible in plan and west facing section)	Cuts 310 and 312
325	Deposit	Rubbish deposit revealed within upper southern layer of trench	Underlies 301
326	Deposit	Stoney deposit found within base of trench at northern end	Underlies 304
401	Deposit	Topsoil- Light greyish brown silty sand	Overlies 404
402	Cut	Cut of machine gun pit for firer/loader	Cuts 404 and 405
403	Deposit	Mid to dark brown sandy silt	Fill of 402
404	Deposit	Subsoil light to mid brown sandy silt	Overlies 405
405	Deposit	Geological natural-weathered/degrading limestone bedrock	Underlies 404

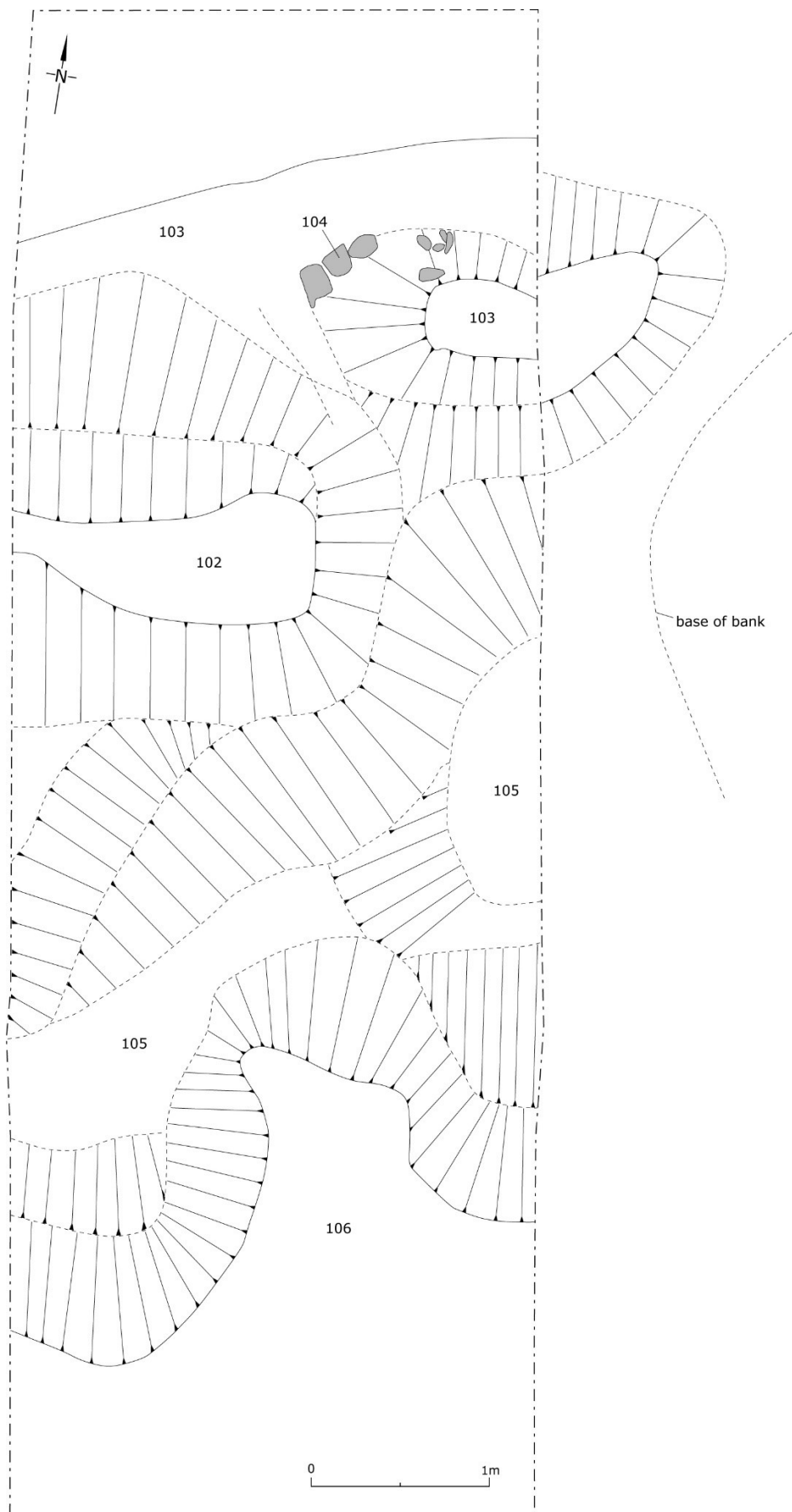


**Figure 29:** Location of excavation trenches.

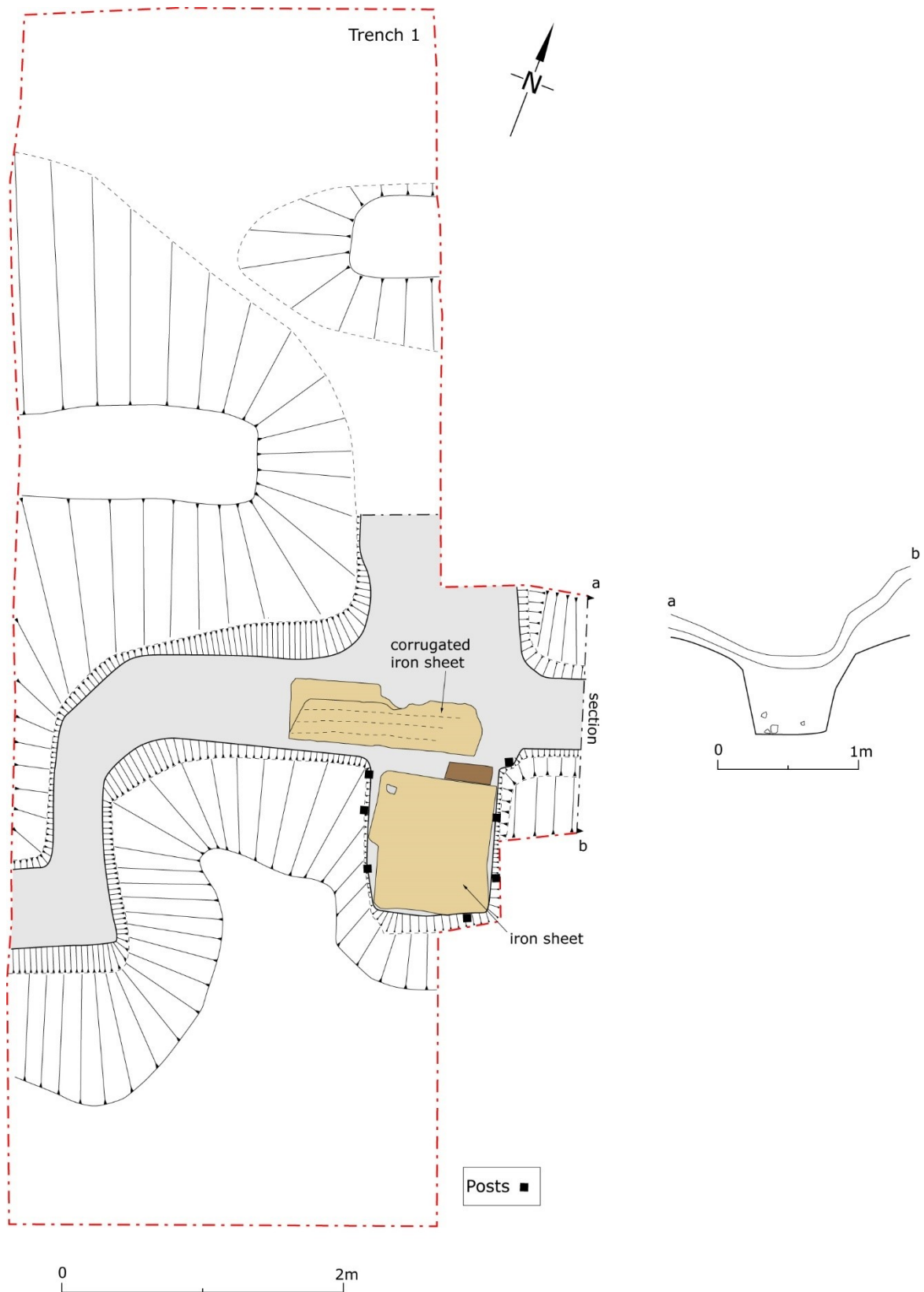


**Figure 30:** Hachure plan of the trench locations at Area 1.

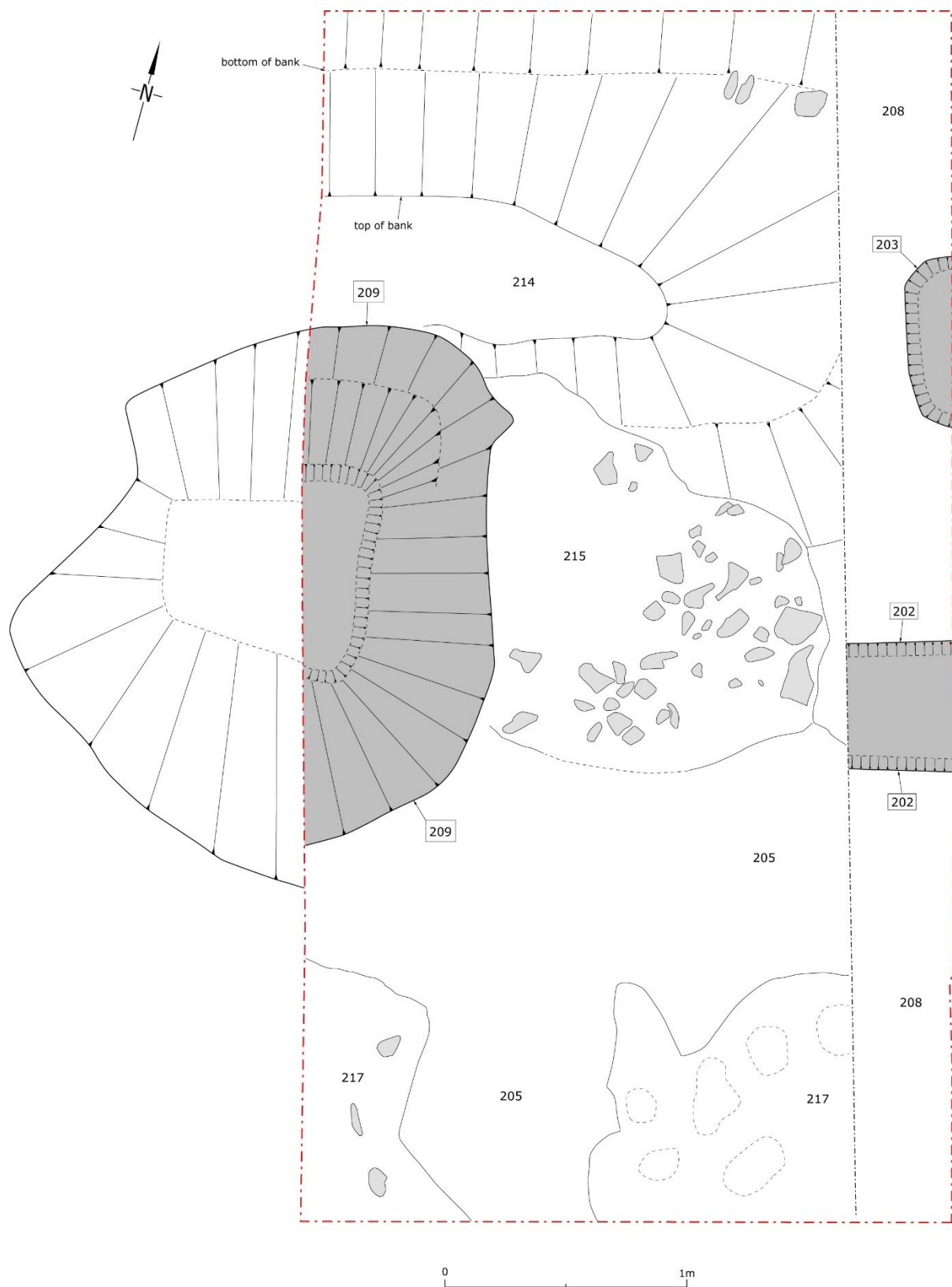




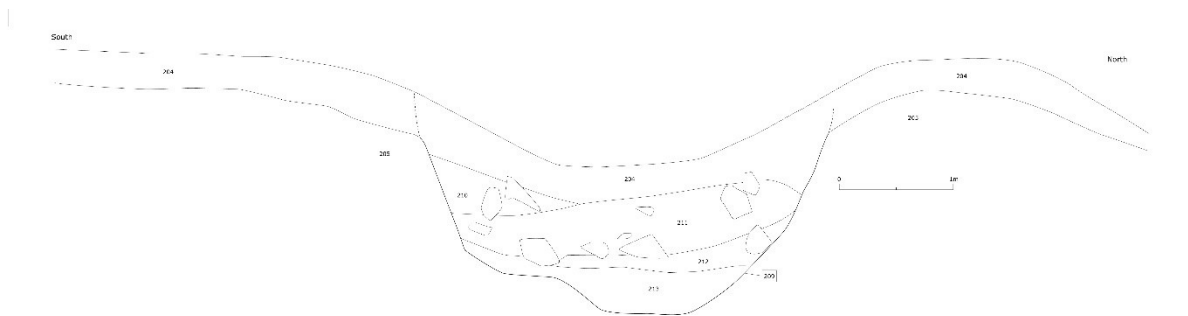
**Figure 31:** Trench 1 hachure plan.



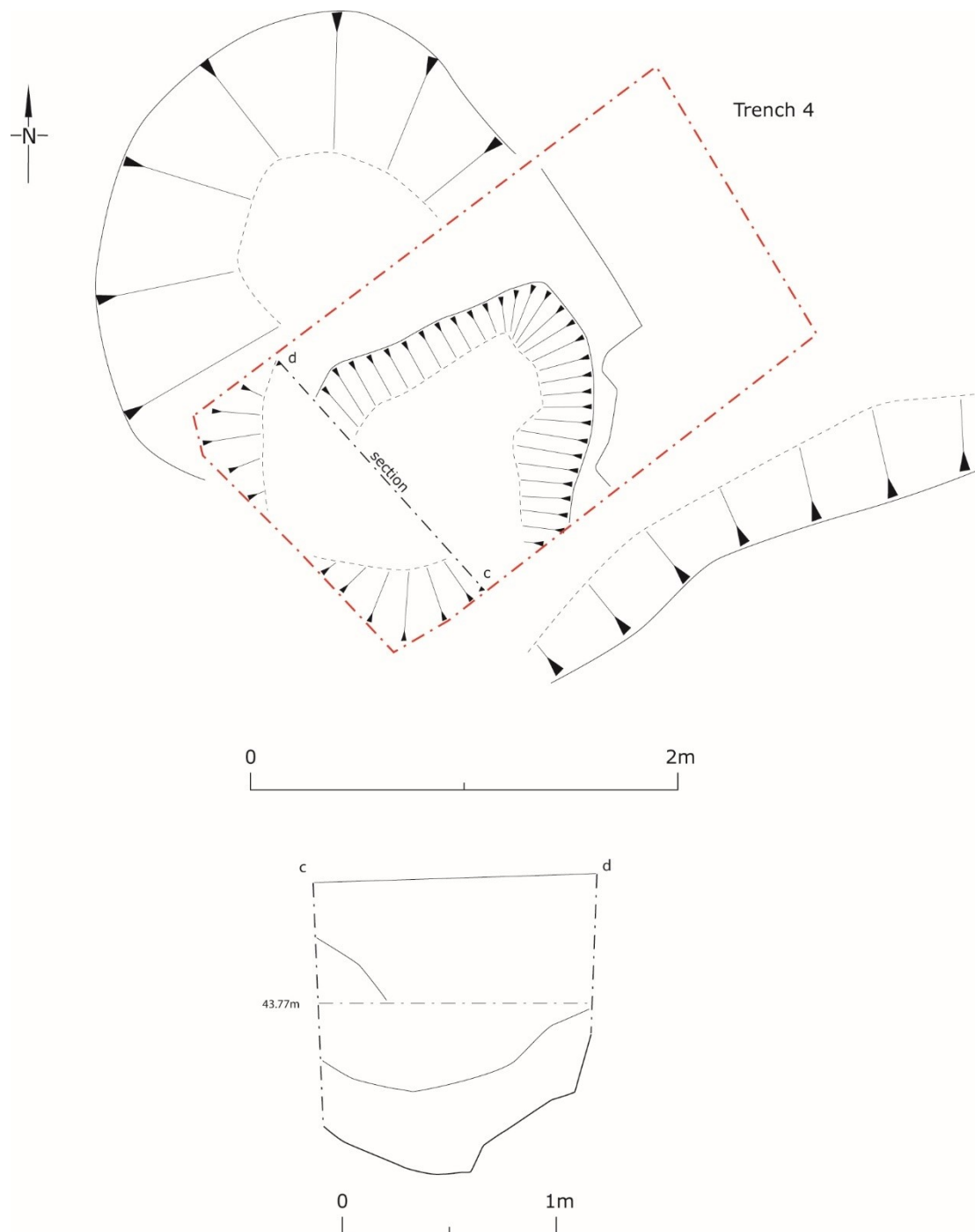
**Figure 32:** Trench 1.



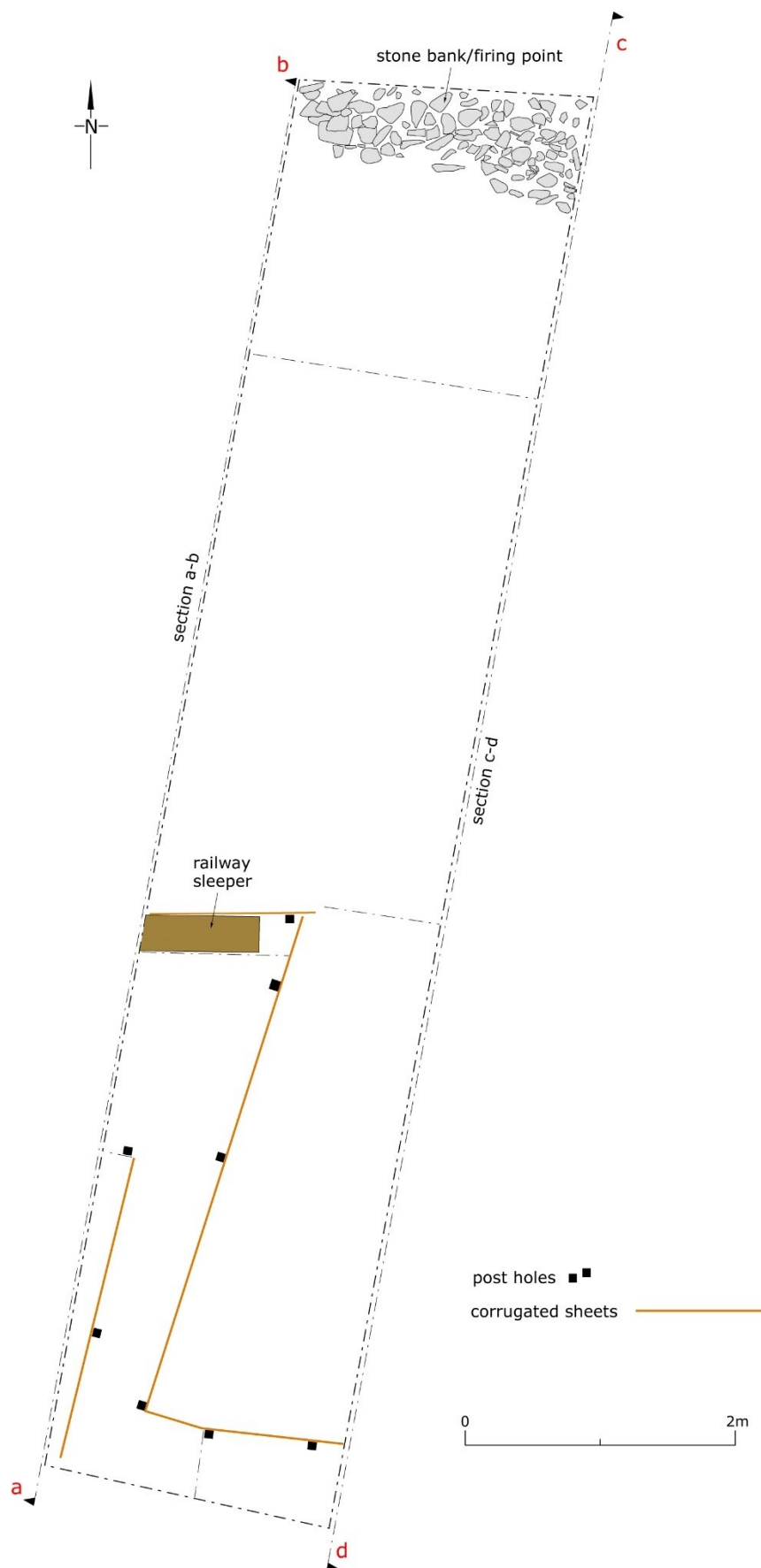
**Figure 33:** Trench 2 plan.



**Figure 34:** Trench 2 - east facing section with pit.

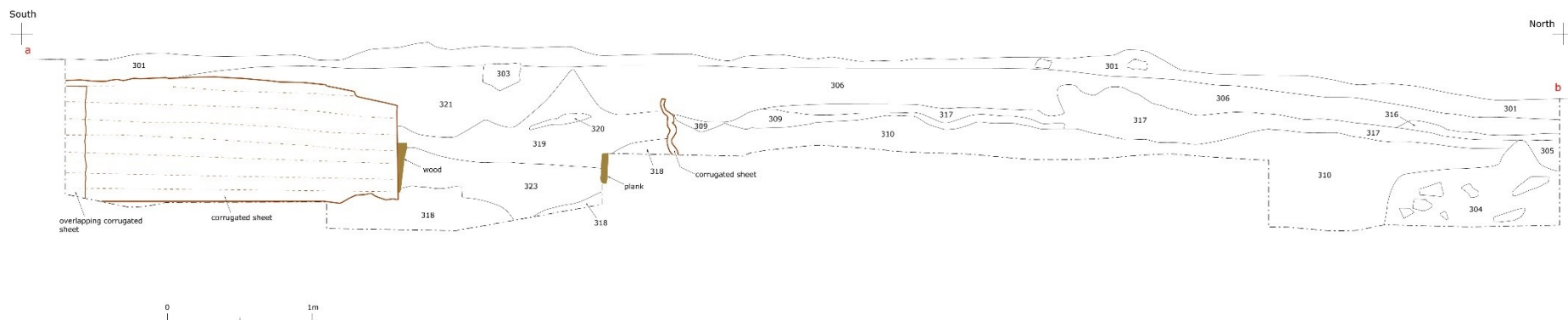


**Figure 35:** Trench 4 plan and northeast facing section.

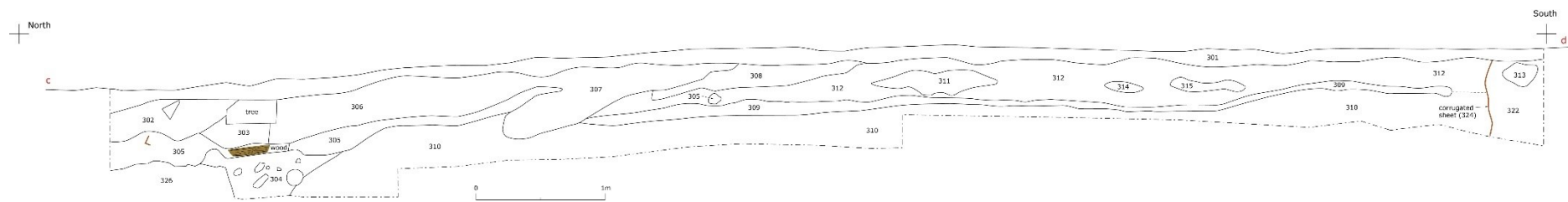


**Figure 36:** Trench 3 plan.





**Figure 37:** Trench 3 east facing section.



**Figure 38:** Trench 3 west facing section.



**Photograph 4:** Trench 1 - Looking south, a post-excitation view of the trench fully cleaned and excavated. 1 x 1m scale.



**Photograph 5:** Trench 1 - Looking south at recess fully excavated. 1 x 1m and 1 x 0.5m scale.





**Photograph 6:** Trench 1- Looking east at *in situ* preserved wooden plank revealed at entrance of recess. 1 x 0.5m scale.



**Photograph 7:** Trench 1- Fragment from metal plate (profile view).





**Photograph 8:** Trench 1- Fragment from metal plate with evidence for edging.



**Photograph 9:** Trench 1- Looking east at trench base continuing into section with true edges of practice trench revealed. 1 x 0.5m scale.





**Photograph 10:** Trench 2, pit cross section in the east edge of trench. Scales 0.50m.



**Photograph11:** Trench 4, section through pit. Scales 1m and 0.5m.





**Photograph 12:** Trench 4, looking south within Machine gun pit, also present within the section is the entrance to the pit which in turn connects to the main trench system located to the south. 1 x 1m and 1 x 0.5m scale



**Photograph 13:** Trench 3 showing the corrugated iron traverse.





**Photograph 14:** Trench 3, looking N at preserved timber situated within excavated practice trench. 1 x 0.5m scale.



**Photograph 15:** Trench 3.



**Photograph 16:** Trench 3, north end showing stone bank interpreted as a firing point. 1 x 1m scale.

## **7. FINDS**

Very little in the way of munitions was discovered in the practice trenches (Trenches 1, 2, 4). Trench 3 had the most evidence for munitions use. Below the finds are listed by trench with identification by Roger J C Thomas. Where context is known this is shown in brackets, otherwise finds are unstratified (Photos 17-19)

### **7.1 Trench 1**

(105) Fragment of polished mace head?

(105) Flint scraper.

(105) X 6 Pottery - white and blue glazed pottery fragments.

(105) Plastic name tag 'ANDERSON' British Armed Forces c. 1960-70s.

(105) Glass fragments including an almost complete inkwell.

(101) x3 Pottery fragments.

(101 x2 Glass fragments.

Backfill - Glass stopper 'Aire and Calder Bottle Co.' (1836-1913), pottery and glass fragments.

### **7.2 Trench 2**

(212) .303 blank cartridge case.

(204) x3 .22 cartridges long, varying condition, 1884 onwards, still in current use, no headstamp information, however, these cartridges are likely to have been fired either from a Martini-Henry or Lee Enfield rifles bored to .22 for training purposes.

(204) x2 Pottery earthenware.

### **7.3 Trench 3**

Martini-Henri cartridges x 18 (north end).

Exploded shell fragment, stripped copper envelope (jacket) (probably from a .303 bullet), NB impression of rifling grooves.

.303 cartridge case, head stamp KN 16 VII i.e. King's Norton 1916 Mark VII.

Martini-Henry .45 lead and zinc alloy bullet, weight approx. 480 grains.

.303 cartridge case, head stamp KN 17 VII i.e. King's Norton 1917 Mark VII.

.303 Mark VI ( c ) bullet, with cupro-nickel envelope and lead and antimony core.

.303 blank cartridge case, head stamp RL VI i.e. Royal Laboratory Mark V.

.303 cartridge case (damaged), head stamp L 17 VII Birmingham Metals and Munitions Co. Ltd. 1917 Mark VII (South end of trench).

.303 cartridge case (damaged), head stamp marks not determined.

Snider bullet, produced at .573-inch diameter and designed to expand upon firing to fit the .577-inch calibre of the bore and made of lead with an iron base disc (South end of trench).

.303 blank cartridge case, head stamp probably indicates Greenwood and Batley.

.303 cartridge case, head stamp represents Ely Bros. 1918 Mark VII (south end of trench).

.303 cartridge case, head stamp 18 Z VII i.e. nitro cellulose propellant 1918 Mark VII (south end of trench).

.303 cartridge case, head stamp representing United States 1916 Mark VII (south end of trench).

pottery fragments of either a marmalade or jam jar (south end of trench).

x3 .303 Mark VI ( c ) bullet, with cupro-nickel envelope and lead and antimony core (south end of trench).

Martini-Henry .45 lead and zinc alloy bullet, weight approx. 480 grains (south end of trench).

fragment of the fin of a Bomb, Muzzle Loading, High Explosive, 3-inch Mortar, 10-LB Mk II, used from early 1930s to 1965.

hook bolt used either for securing corrugated sheeting to roof purlins, wall rails etc or as a wire straining bolt.



corroded coil of wire.

X 2 steel retaining cleats, possibly from target features used on the field firing range.

#### **7.4 Trench 4**

Flint blade.

Flint scraper.

(403) x2 White glazed pottery fragments.



**Photograph 17:** A selection of finds from Trench 1.





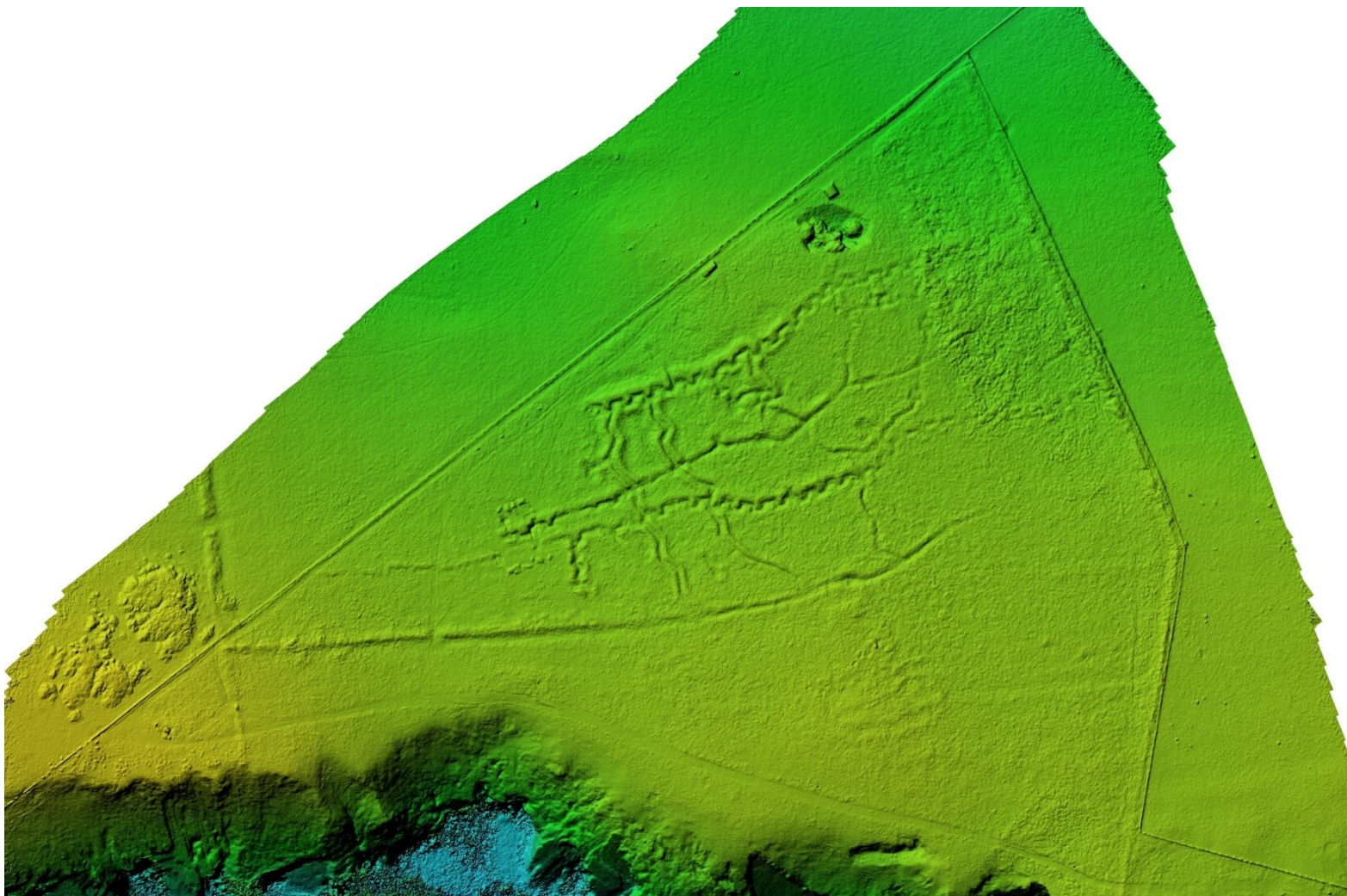
**Photograph 18:** Trench 2, .22 and (blank) .303 cartridges.



**Photograph 19:** Trench 3, Martini-Henri rifle cartridges, first entered Army service in 1871.

## **8 3D VISUALISATION**

- 8.1.1 Aerial Cam undertook drone fieldwork on the 20<sup>th</sup> June 2019 to capture a photogrammetric survey, resulting in Digital Elevation Models (DEM) of micro-topography and general topography, along with orthophotographs and 3D models. Digital Elevation Models were processed at a resolution of 2-4cm. These are georeferenced to be able to drop into GIS. A short drone video and still photographs were also captured.
- 8.1.2 This has allowed a detailed topographic survey, which has not been carried out before, although grass and bracken coverage has reduced some of the detail, particularly on the eastern side of the site.
- 8.1.3 Following the drone survey interpretation has taken place with the help of Roger J C Thomas to identify some of the features within the trench complex (Figs 39 and 40).



**Figure 39:** Penally practice trench DEM survey (Aerial Cam).





**Figure 40:** Interpretative plot of Penally practice trench from DEM survey.

## **9. DISCUSSION**

### **9.1 Area 1 Penally Practice Trenches**

- 9.1.1 Geophysics have found no evidence to suggest that further trenches extend in the fields to the north, east or west.
- 9.1.2 Different phases of trench construction may be present. Multiple fire trenches are visible, which may indicate that those to the middle and rear of the system have been superseded by the most forward of fire trenches.
- 9.1.3 The excavation has revealed the excellent preservation of the cut features, and the complexity of features preserved within the trench system.
- 9.1.4 It has not been possible to positively identify some of the characteristic features shown in the manuals of the time, such as an elbow rest, and fire step, however the definition for the trench sides was not easy to find at first, and it is likely that some of the steeper sides have slumped.
- 9.1.5 The function of recess cut into the rear of Trench 1 is unconfirmed, but it may have been a bombing pit, for training to throw bombs or grenades forward, or perhaps a shelter. Manuals show bombing pits were 4 ft square with an expanded metal cage sitting within a cut (Fig. 41). Bombing pits in the manuals are normally situated in the ground between the fire and the support (supervision) trenches, and were usually accessed off the support trench. The manual notes that, 'If the enemy's bomb strikes the E.M. (Expanded Metal) or rolls over the parapet it falls into the space behind the steel plates where it explodes harmlessly.' (Notes for Infantry Officers on Trench Warfare, fig. 9)
- 9.1.6 Little in the way of munitions were found, finds were predominantly glass and pottery which derived from jam, fruit bottle or food containers. A fragment of a possible Neolithic polished stone mace/axe head was also discovered.
- 9.1.7 Trench 2 – The excavation at Trench 2 investigated a line of depression which almost formed a trench. The pit in Trench 2 would appear to be a foxhole, which had not yet been fully excavated into a trench proper, as described in the manuals of the time; 'In the construction of a line in the presence of an enemy the first object is to get some sort of cover, as quickly as possible, for the firing line. Normally what happens is that individual men start to dig pits for themselves where they were when the advance stopped. As soon as possible these pits are joined up with one another to form a continuous fire trench.' (Notes for Infantry Officers on Trench Warfare 1916, p19). The further trench seen in the east section may be the trench which started to connect up the individual foxholes.
- 9.1.8 Trench 4 targeted a pit which lay forward of the fire trench. This pit demonstrates the characteristics of a forward machine gun position, with a definite platform to the front to take the tripod of a machine gun. The pit was very deep with an entrance to it from the line of trenches behind it. There was only room enough for one or two men in the pit.

### **9.2 Area 2 – Penally Training Area**

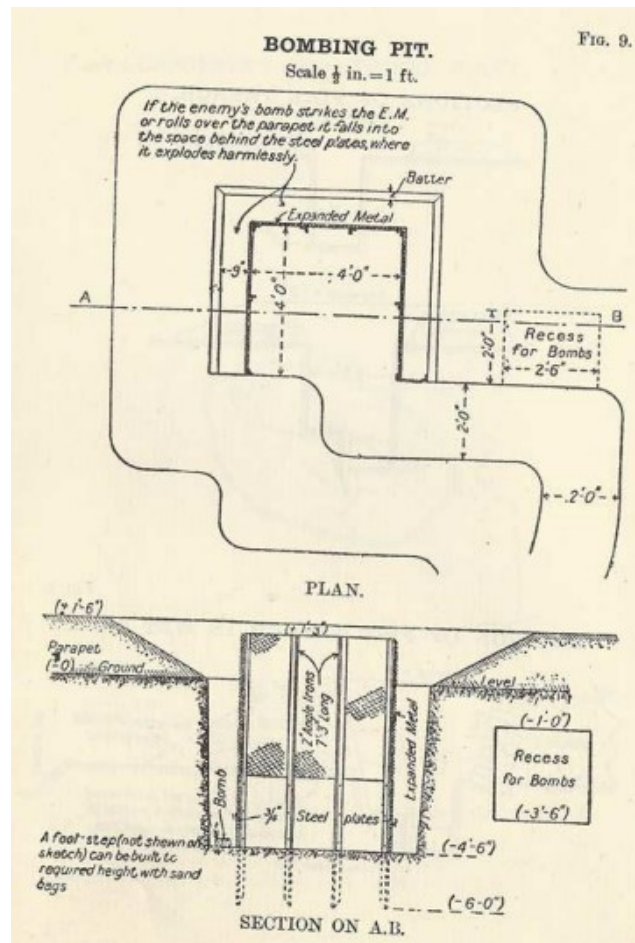
- 9.2.1 The Trench 2 was positioned to cross-section the significant geophysical anomaly which was believed to be the fire trench which was visible on the 1941 aerial photographs.



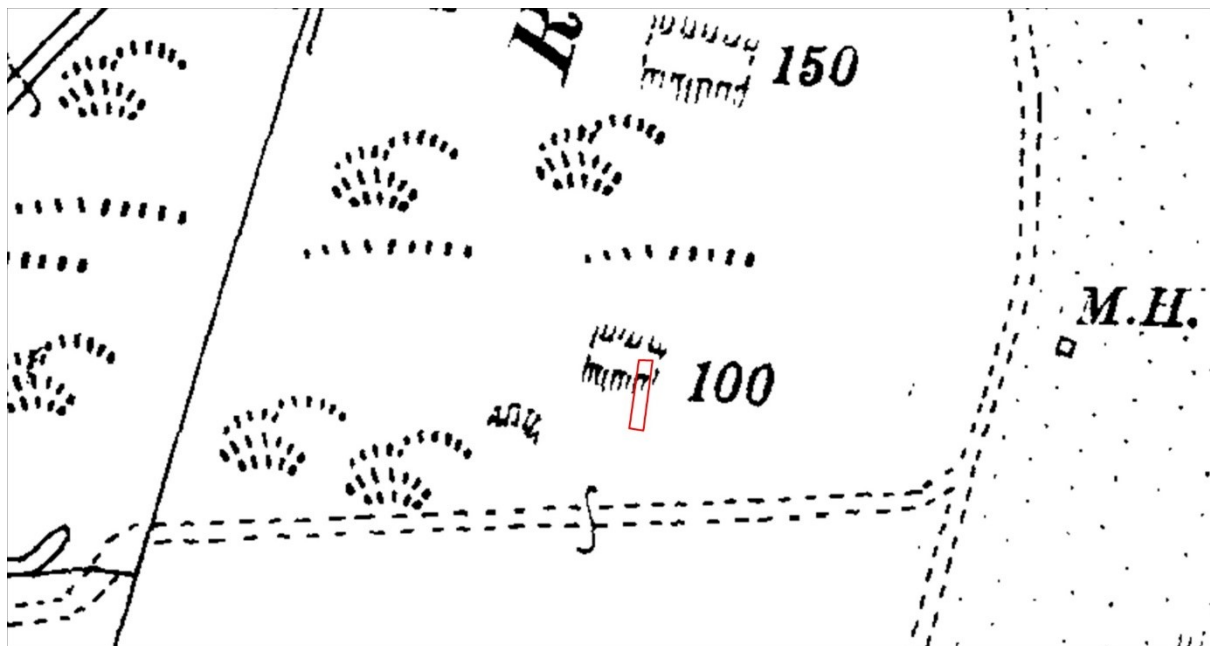
- 9.2.2 The excavation not only was successful in confirming the location of a second area of practice trenches built during the First World War, it provided a valuable insight into the construction methods and materials used.
- 9.2.3 At the north end a further discovery was unexpected, though when the trench location was overlaid the 1st edition Ordnance Survey map, it confirmed that the stone bank which was revealed at the north end was the remains of the 100 yard firing point (Fig. 42). The abundance of Martini-Henri cartridge cases (in use from 1871) demonstrates the early use of this firing range.

### **9.3 Area 3 - Yeomanry Field**

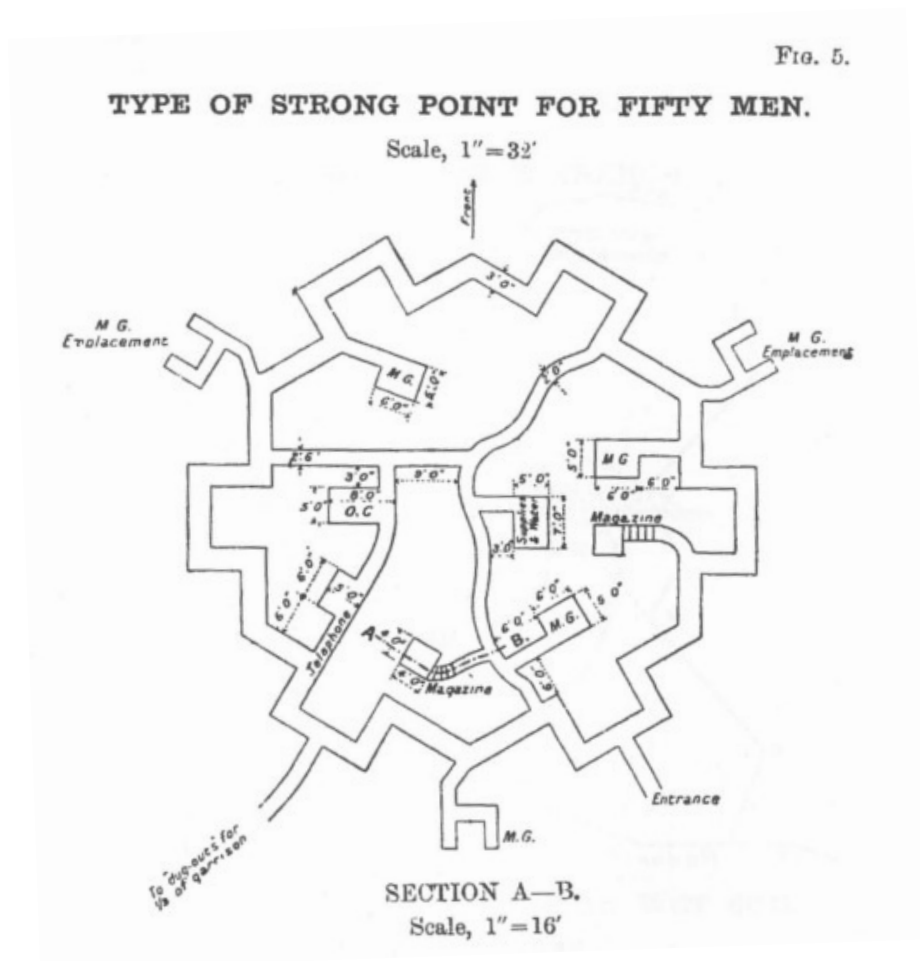
- 9.3.1 Investigations in this area were perhaps the most speculative; prior to the investigations in 2019 there was no evidence for intact in situ archaeological deposits in the area known as Yeomanry or Volunteers Field. The only evidence was the now well-known photograph of the men digging practice trenches roughly somewhere in this location, but whether the bypass had destroyed this was not known.
- 9.3.2 Aerial photographs, or LiDAR prior to 2018 had not revealed any indications; the land has been agriculturally worked for the whole of the 20th century and so no earthworks were visible.
- 9.3.3 Although Google Earth shows satellite photographs taken during the dry summer of 2018, which did indicate a feature which ties in with the results of the Geophysics, this was not available prior to the start of the survey work.
- 9.3.4 Geophysics on the west side of the bypass drew a blank, with no indication of magnetic features suggesting anything other than random ferrous objects.
- 9.3.5 Geophysics on the east side gave a positive reading of a subrectangular feature c 15-35m with a long axis north-northwest by south-southeast. These results were confirmed by Ground Penetrating Radar which was carried out by volunteer Tim Fletcher of Geoscope. Indicating a feature which may have caused slumping and a slight depression in the field.
- 9.3.6 The non intrusive survey methods do not necessarily confirm that these are the practice trenches shown in the photograph; they not give the classic impression of traverses commonly seen on practice trenches. However examining the photograph in further detail the excavations do not necessarily appear to be a linear trench with the characteristic traverses or fire bays. It is possible the Royal Engineers depicted in the photograph may be constructing a redoubt or strongpoint, which may take the shape of an enclosure in plan (Fig. 43). Until further exploratory investigations can take place it will remain unconfirmed.



**Figure 41:** Diagrams of a bombing pit. (Notes for Infantry Officers on Trench Warfare 1916).



**Figure 42:** Trench 3 overlying the 1<sup>st</sup> edition Ordnance Survey map of 1889 (© and database right Crown copyright and Landmark Information Group Ltd (All rights reserved 01/03/2022)).



**Figure 43:** Type of Strong point or redoubt.

## 10. CONCLUSIONS

- 10.1.1 The project has successfully investigated three areas of archaeological interest in the Penally training area, these include:
- 10.1.2 Area 1 Penally Practice Trenches – excavations showed the excellent preservation of cut features and the complexity of the trench system and that many other features must exist which are currently not visible through the earthworks alone.
- 10.1.3 The trenches were kept very clean as very little artefactual evidence was discovered.
- 10.1.4 The scheduled area does not include further associated features which are integral to the rest of the complex.
- 10.1.5 There may be more than one phase of trench construction represented within the complex.
- 10.1.6 Area 2 Penally Training Area – the geophysics has successfully revealed features which have been confirmed through the excavation.
- 10.1.7 The excavation has revealed two phases of use, the earlier rifle range demonstrated by the firing point.

- 10.1.8 A practice trench was constructed probably during the First World War, using different construction techniques than those in Area 1, using corrugated iron as a revetment material due to the construction of the trenches in sand.
- 10.1.9 Area 3 Yeomanry field – Geophysical survey and ground penetrating radar have revealed a sub rectangular feature which may be the remains of practice trenches which are known to have been constructed during the First World War.
- 10.1.10 The investigations form part of a suite of archaeological work carried out on First World War sites across Wales by the Welsh archaeological trusts, including other excavations on practice trenches at Bodelwyddan (2014), and Cichle in Gwynedd (2015).

## **11. HISTORIC ENVIRONMENT RECORD**

- 11.1.1 As a result of the project the Historic Environment Record has been enhanced and updated. Eight sites recorded on the HER have enhanced and updated with new information, sources and photographs and an additional 6 new records have been created. These are now available to be interrogated on the website Archwilio, see figure 44 below.



PRN	Site Name	Type	NGR	url
29912	THE BURROWS PENALLY	FIRING RANGE	SS12009890	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT29912&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT29912&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
29913	THE BURROWS PENALLY	FIRING RANGE	SS12359895	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT29913&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT29913&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
30041	PENALLY BURROWS	RIFLE BUTTS	SS12149857	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT30041&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT30041&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
32821	VALLEYTOP FIELD; WD BS NO1	BOUNDARY STONE	SS10869837	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT32821&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT32821&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
33458	PENALLY	PRACTICE TRENCH	SS112985	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT33458&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT33458&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
107820	YEOMANRY FIELD; VOLUNTEERS' FIELD	MILITARY CAMP	SS11959982	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT107820&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT107820&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
109340		PRACTICE TRENCH	SS11959869	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT109340&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT109340&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
111277		FIRING RANGE	SS11919889	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT111277&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT111277&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
125765		FIRING RANGE	SS1155798697	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT125765&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT125765&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
125766	NO. 1. LOOKOUT	LOOKOUT	SS1220898449	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT125766&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT125766&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
125767		BUTTS	SS11819862	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT125767&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT125767&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
127859		QUARRY	SS11209860	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT127859&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT127859&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
127863	NO 3 LOOKOUT	LOOKOUT	SS11329870	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT127863&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT127863&amp;dbname=\$geoGroupId&amp;tbnname=core</a>
127864		PRACTICE TRENCH	SS12039975	<a href="https://archwilio.org.uk/arch/query/page.php?watprn=DAT127864&amp;dbname=\$geoGroupId&amp;tbnname=core">https://archwilio.org.uk/arch/query/page.php?watprn=DAT127864&amp;dbname=\$geoGroupId&amp;tbnname=core</a>

**Table 3:** List of sites add to the Historic Environment Record.

## **12 OUTREACH**

The project at Penally was designed to maximise involvement of the public and efforts were made to make it as inclusive as possible. Penally History Group were a valuable partner in being able to publicize the events locally and in having contacts with local institutions.

### **12.1 Volunteers:**

12.1.1 Twenty-one volunteers were involved in the excavation itself contributing a total of 96 volunteer days. Nine were from southwest Wales, the others had travelled from further afield, Portsmouth, Cardiff, North Yorkshire. Seven had never volunteered with Dyfed Archaeological Trust before and some had never volunteered on an archaeological excavation.

12.1.2 Volunteers from the Penally History Group (in particular David Glennerster and John Cliff), provided support in giving tours of the excavation and training area and supported the excavation team.

12.1.3 The project drew in a range of people most of which had never met before. The Defence Infrastructure Organisation provided accommodation for volunteers in the Penally Army Camp, which provided an interesting and, for most people, a unique experience of army life in barracks! Although not everyone lived in barracks those that did ate food in the NAAFI, slept in dormitories, and shared a unique experience which also offered a social life spending evenings either in the mess or at the pub.

### **12.2 Operation Nightingale**

Two volunteers were able to join the excavation from Operation Nightingale for nine days in total, see below for feedback.

### **12.3 Manorbier V.C.P School**

12.3.1 A visit to the school took place on the 14<sup>th</sup> June 2019, where an archaeologist met the teachers and all the school children to talk to them about the excavation. They had a discussion about archaeology and the First World War, and the children talked about their recent project looking at who from their area had been involved in the war and creating a wall of poppies. A briefing with the teachers also provided information about what to expect and any health and safety issues which needed to be addressed.

12.3.2 On the 20<sup>th</sup> June 2019 32 pupils from the school (Years 3,4,5,6) spent the whole day at the excavation. The children were divided into smaller groups and rotated around a number of activities including:

- a timeline of artefacts, learning about artefacts from different time periods and placing them in the correct order.
- a taster test pit where the pupils could have a go trowelling and excavating.
- in the trenches themselves a 'treasure hunt' was laid and the pupils had to find the answers to the questions on a quiz sheet.
- a handling collection and talk was given by Roger J C Thomas who showed the children the contents of a soldiers pack, the equipment they would be expected to carry, and a day in the trenches.

12.3.3 The weather was lovely and the children enjoyed themselves and many said on their way home that they would like to be an archaeologist!

## **12.4 Community Open Days**

12.4.1 8<sup>th</sup> June 2019 – thirteen members of Cardiff Archaeology Society visited the excavations as part of their south Pembrokeshire tour.

12.4.2 15<sup>th</sup> June 2019 – Open Day, 2 guided walks to the trenches. Forty-five people attended. Volunteers Roger J C Thomas and David Glennerster provide talks along with DAT staff.

## **12.5 Talks**

12.5.1 20<sup>th</sup> June 2019 – A talk was held in Penally village hall, with an illustrated presentation from Roger J C Thomas on the history and context of Penally during the First World War. An update on the excavations was also given. Fifty-eight people attended. Penally History Group provided refreshments.

12.5.2 5<sup>th</sup> October 2019 - Talk and exhibition in Penally village hall and walk up to the trenches, 28 people attended.

12.5.3 9<sup>th</sup> November 2019 – A talk and exhibition on the excavations at Penally was delivered at the Pembrokeshire Coast National Park Archaeology Day, with around 200 people attending.

## **12.6 Feedback**

### **12.6.1 Excavation participants:**

'As far as feedback goes. I only have positive comments. It was well organised, easy to join and the free lunches were a bonus.'

'The whole experience was a great insight into archaeology fieldwork and everyone was very welcoming in the group. I look forward to doing something with you again in the near future.'

'You were great company and helped me to feel better about myself. I'm hoping to start another dig this week, on Salisbury plain this time, with the same veterans group that got me on yours.' – Operation Nightingale volunteer

'...it did make me think a lot about it afterwards, when i thought about what the people who used the trenches must of gone through. Very different to any of the other digs I have been on, very recent compared to the others and made me think about it in a different way. All good though because I learnt a lot and I did enjoy the talk in the hall as well.'

'I really enjoyed my time at the Penally dig, yes we did have a laugh and it was good getting to know you and everyone involved within the project. Archaeology is so diverse in the nature of the people involved and what the experience means to each person. I want to try and use that in my dissertation.

Its more than just digging up the past to record and document, its an event that educates and can bring positive aspects to peoples life's, and at the same time opening discussion about our surrounding heritage.' Archaeology Student and local volunteer.

'I have walked around the trench area many times over the years, and now feel very much part of them. It was also good to see the response to us from the locals, made to feel very much part of their community.'

### **12.6.2 Participants at the talks and guided tours**

'I was not aware that these trenches existed. It was very interesting to find out about them'

'It only goes to reinforce what a painstaking process archaeology is but also fascinating'

'Our thanks for organising this and thanks to Alice for hosting the tour. Sandra and I found it fascinating and learned lots from the experts!'

The ability to offer volunteers travel expenses was a great benefit allowing some of the volunteers the ability to be able to travel everyday to the excavation, which may not have been possible otherwise due to the costs. In addition the provision of accommodation and food by the MoD allowed a more social dimension to the project, those that stayed on the camp spent time together after the working day, discussing the project and all manner of other topics.

## **13. MANAGEMENT RECOMMENDATIONS**

13.1.1 The project has provided the first opportunity to investigate the nature and extent of the archaeology on the Penally Training area and is the first time that Yeomanry field has been explored.

13.1.2 The practice trenches have been recognised as nationally important and are a scheduled monument. However, there are significant archaeological remains which lie outside of the scheduled area, although they are clearly part of the same complex. This project will be able to justify and recommend that the scheduled area is revised to include the whole complex.

13.1.3 This project has updated the Historic Environment Record (HER), with a number of new sites added and some existing records enhanced and updated, these are now available to the public via [www.Archwilio.org.uk](http://www.Archwilio.org.uk). In addition a number of sites are now recorded by polygons to show their extent, instead of just point data which will allow better informed management decisions to be made in the future.

## **14. PROJECT TIMELINE**

4<sup>th</sup> – 21<sup>st</sup> June 2019 - Fieldwork at Penally. 21 volunteers involved. Numerous visitors came to see the excavations, some were casual visitors who were walking on the footpath or coastal path, and many local people had heard about the excavations and wanted to see what was happening.

8<sup>th</sup> June 2019 – Cardiff Archaeology Society visit the excavations as part of their South Pembrokeshire tour.

10<sup>th</sup> June 2019 – Volunteer Tim Fletcher (Director of Geoscope) conducts a ground penetrating radar survey of Yeomanry field.

14<sup>th</sup> June 2019 – An archaeologist visits Manorbier School to talk to the teachers and children about the First World War and introduce them to the site.

15<sup>th</sup> June 2019 – Open Day, 2 guided walks to the trenches. 45 people attended.



19<sup>th</sup> June 2019 – Aerial Cam conduct a 3D drone survey of the trench system with excavation in progress.

20<sup>th</sup> June 2019 – Manorbier Primary School (Years 3,4,5,6) spend the day at the excavations, 32 pupils visited with teachers and parent assistants.

20<sup>th</sup> June 2019 – A talk is held in Penally village hall, with an illustrated presentation from Roger JC Thomas (Historic England) on the history and context of Penally during the First World War. 58 people attend. Penally History Group provide refreshments.

5<sup>th</sup> October 2019 - Talk in Penally village hall and walk up to the trenches, 28 people attended.

9<sup>th</sup> November 2019 – A talk on the excavations at Penally was delivered to Pembrokeshire Coast National Park Archaeology Day, around 200 people attended.



**Photograph 20:** Open Day 15<sup>th</sup> June.



**Photograph 21:** Manorbier School visit, using the trench periscope.



**Photograph 22:** Manorbier School visit, quiz and treasure hunt.



**Photograph 23:** Manorbier School visit, excavation taster.



## **15. SOURCES**

### **15.1 Publications**

Brown, D.H., 2011. *Archaeological Archives: A guide to best practice in creation, compilation, transfer and curation*. Chartered Institute for Archaeologists.

Brown, M., 2017. First World War Fieldworks in England Research Report Series No 61/2017

Clwyd-Powys Archaeological Trust 2014 Bodelwyddan Castle Park Practice Trenches, Denbighshire. Archaeological Investigations Report No 1303

Kenney, J. and Hopewell, D., 2015. First World War Military Sites Military Landscapes Report No 1248

War Office 1916, Notes for Infantry Officers on Trench Warfare.

Wessex Archaeology 2004 Penally Training Area, ATE Pembroke Archaeological Deskbased Assessment and Condition Survey Ref: 53268.02

### **15.2 Database**

British Geological Survey [online] Available at: [Accessed January 2019]

Dyfed Archaeological Trust Historic Environment Record.

### **15.3 Websites**

British Geological Survey mapping portal. Available at:

<http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

Cof Cymru. Available at:

<https://cadw.gov.wales/advice-support/cof-cymru>

Tithe Plan of the parish of Penally in the County of Pembroke, 1842. Available at:

[https://places.library.wales/browse/51.656/-4.726/14?page=1&alt=&alt=&parish\\_facet%5B%5D=Penally&leaflet-base-layers\\_66=on](https://places.library.wales/browse/51.656/-4.726/14?page=1&alt=&alt=&parish_facet%5B%5D=Penally&leaflet-base-layers_66=on)



An unexpected visitor to the site mess tent (Jon Morgan).