1330

New Ysgol Bro Aberffraw Primary School Newborough, Anglesey

Archaeological Watching Brief

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

New Ysgol Bro Aberffraw Primary School, Newborough, Anglesey

Archaeological Watching Brief

Project No. G2467

Report No. 1330

Prepared for: Cyngor Sir Ynys Mon

September 2016

Written by: Anne Marie Oattes

*front cover image: general view of Field 2 from SSE (archive image G2467_0021)

Cyhoeddwyd gan Ymddiriedolaeth Achaeolegol Gwynedd
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Approvals Table				
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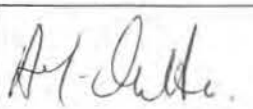
Originated by	Document Author	Anne Marie Oattes		8-9-16
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Approved by	Principal Archaeologist	John Roberts		08/09/16

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Plate 04: Field 2 - length of TP5 viewed from the south west, scale = 2x1m. (Archive image G2467_210)

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1 NON-TECHNICAL SUMMARY

Gwynedd Archaeological Trust completed an archaeological watching brief during geological ground investigation works carried out by TerraConsult Ltd. at the proposed site for the New Ysgol Bro Aberffraw Primary School, Newborough, Ynys Môn.

A geophysical survey and desk-based assessment were completed within the proposed site by Gwynedd Archaeological Trust in May 2016, followed by an archaeological evaluation in July 2016. A total of twenty trenches were excavated within the two fields, which resulted in the identification of a stone walled building in the south west corner of Field 1, and a possible prehistoric ditch in Field 2. The archaeological watching brief was completed in August 2016 and monitored the ground investigation works in the vicinity of these two areas of archaeological interest. The monitored works included a soakway and two test pits; no archaeological activity was identified within the confines of the monitored areas. The monitored areas were characterised by shallow topsoil and a thick subsoil with the glacial horizon encountered at a minimum depth of 0.75m.

1 INTRODUCTION

Gwynedd Archaeological Trust (GAT) was commissioned by *Cyngor Sir Ynys Môn* to undertake a watching brief during geological ground investigation (GI) works at the proposed site for the New Ysgol Bro Aberffraw Primary School, Newborough, Ynys Môn (NGR SH42476601). The site is currently a greenfield site, consisting of two fields set aside for pasture (Figure 1).

A geophysical survey and desk-based assessment (Phase 1) were undertaken in May 2016 by GAT and the results of these were used to locate trenches for a programme of trial trenching (Phase 2) undertaken in July 2016 (Figure 2). A total of 20 trenches were excavated within the two fields (Figure 2, TR01-20). The results of the trial trenching (McGuinness, 2016: GAT Report 1329) indicated the presence of a stone walled building represented on 18th century maps, both at the south end of TR01 and the southeast end of TR09 in the southwest corner of Field 1. A possible prehistoric ditch was encountered in TR19/Field 2, within an area of potential prehistoric activity indicated by the geophysical survey results.

The watching brief was conducted during geological ground investigation works (Phase 3) which were carried out by at the site by TerraConsult Ltd between Monday 22nd August and Tuesday 23rd August 2016 (Figure 2; Appendix I, Appendix II). The GI works comprised the digging of:

- 5 cable percussive boreholes (CBR) to prove rockhead (BH 1-5);
- 5 trial pits with CBR determinations by plate load test (TP 1-5; CBR 1-5); and
- 4 soakaway tests in accordance with BRE 365 (SW 1-4).

Gwynedd Archaeological Planning Service (GAPS) requested that an archaeological watching brief be conducted during GI works in the vicinity of these two areas of archaeological interest. The scheme was monitored by GAPS and the report will need to be approved by GAPS.

The archaeological watching brief conformed to the guidelines specified in *Standard and guidance for an archaeological watching brief* (Chartered Institute for Archaeologists, 2014).

2 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

A desk-based assessment, walkover survey, and geophysical survey was carried out by Gwynedd Archaeological Trust in May 2016 (Phase 1; GAT Report 1318), followed by a programme of archaeological trial trenching by GAT in July 2016 (Phase 2; GAT Report 1329). A brief summary of the results of the two phases of investigation are included below.

The desk-based assessment identified that the site lay to the north of the historic core of the medieval town of Newborough, but within an area that was likely to have formed part of the town fields, with evidence of medieval strip fields having been identified in close proximity to the site. The site was identified as having been the property of Lord Boston's Lligwy estate from at least the latter part of the 18th century. A Lligwy estate map of 1782 shows a house and associated paddock in the south west of the assessment area, which is not shown on any later mapping (Figure 2). The Ordnance Survey maps of the later 19th and early 20th centuries shows the current area boundary, along with additional hedgerows that have been grubbed out in recent times. There appears to be a palimpsest of former field boundaries which were formerly present on the site.

The desk-based assessment identified how the field system around the town of Newborough, including those within the area of the development is probably largely medieval in origin (Johnstone 1997). Some of the strips of the open fields are preserved in the modern boundaries and even where the fields are fairly large and rectangular their alignment probably reflects the orientation of the open field strips. The walkover survey further underlined this by identifying gentle undulations in the fields that are suggestive of former field boundaries and possible ridge and furrow agriculture.

The geophysical survey (Figure 3) noted interference in two parts from strongly magnetic bedrock, indicating significant interference from the sub-surface geology, which was not visible on the surface. Linear anomalies were also identified, some of which probably represent field boundaries shown on the historic mapping and aerial photographs. Further linear anomalies probably represent field drains, and a former trackway was identified. A probable former small quarry was noted in the northwest corner of the site.

Twenty trenches measuring 30x2m, each excavated to drift geological or archaeological horizons, were excavated at the site in July 2016. Archaeological features were encountered in 13 of the 20 trenches. The results of the trial trenching (McGuinness 2016, in press) revealed evidence suggesting activity at the site from the prehistory through to the present day. The majority of the features encountered appear to be the remains of field boundary ditches and banks.

Two areas of the site revealed archaeological evidence of particular interest:

- The location of a possible stone walled building, possibly that represented on the 1782 Lligwy estate map. This was encountered in the S end of TR01 and the SE end of the adjacent TR09 in the SW corner of Field 1. This area is located to the SW of the proposed location of TP 1.

- A 1.17m wide, 0.51m deep, possible prehistoric ditch cutting NE-SW across TR19, Field 2. This feature lies within an area of potential prehistoric activity indicated by the geophysical survey results and its extent is uncertain. This area is located to the SE of TP 5 and SW4.

3 METHODOLOGY

An intensive watching brief was maintained in accordance with the Project design for the works (for full details see Appendix I).

The locations of soak away SW4 in Field 2 (centred on NGR SH4251466005), test pit TP1 in Field 1(centred on NGR SH4248365921), and test pit TP5 in Field 2 (centred on NGR SH4250166019), were identified and checked for services with a CAT scanner by an employee of TerraConsult Ltd.

The watching brief was carried out during the excavation of the soakaway (SW4 in Field 2) on 22nd August, and test pits (TP1 in Field 1; TP5 in Field 2) on 23rd August 2016. For the purpose of the watching brief, this involved the removal of the topsoil and subsoil to the glacial horizon using a 13 tonne metal tracked mechanical excavator fitted with a toothless ditching bucket which was supplied by CMP Plant Hire Ltd. The topsoil and the subsoil were removed, stored separately and replaced once the GI works were completed.

A written record of the attendances and excavations was completed using GAT pro-formas.

The locations of the test pits and the soakaway were recorded using a survey grade GPS with <1cm accuracy (model Trimble GNSS/R6/5800). The results were recorded in Ordnance Survey of Great Britain National Grid co-ordinates.

Six digital photographs were taken in RAW format using a digital SLR (Nikon D3100) camera set to maximum resolution (archive files G2467_207- G2467_212). A table of metadata was produced using Microsoft Access (Appendix II).

The paper archive is stored at Gwynedd Archaeological Trust; the digital archive resulting from the fieldwork will be deposited with the RCAHMW in accordance with their guidelines.

4 WATCHING BRIEF RESULTS

4.1 Soakaway SW4 Field 2

Dimensions: 3.6m long x 1.9m wide x 0.9m deep.
Alignment: NW/SE
Photographs G2467_207, G2467_208
Soakaway SW4 was located between Trench 16 and Trench 19 (Figure 3).

The topsoil was 0.20m deep and comprised soft, loose mid brown slightly silty sand with very occasional small sub-angular and sub-rounded stones and very occasional fragments of post-medieval pottery. The subsoil was 0.5m deep and comprised firmer mid brown silty sand with angular and sub-angular pebble inclusions, occasional small cobbles and occasional fragments of post-medieval pottery. The glacial till comprised firm orange brown silty sandy clay with moderate sub-angular pebble and cobble inclusions and was encountered at a depth of 0.75m.

No archaeological activity was identified within the confines of the soakaway.

4.2 Test pit (TP1) Field 1

Dimensions: 3.5m x 2.9m x 0.9m
Alignment: NE/SW
Photographs G2467_211, G2467_212
Test pit TP1 was located between TR01 and TR02 (Figure 3).

The pit was widened to allow for stepping at the sides due to the soft nature of the soil. The topsoil comprised medium brown clayey sand with a depth of 0.2m; the subsoil comprised medium brown clayey sand with a depth of 0.6m. The glacial till comprised reddish brown gravelly clay sand with occasional sub-angular cobble inclusions and was encountered at a depth of 0.8m.

No archaeological activity was identified within the confines of the test pit.

4.3 Test Pit (TP5) Field 2

Dimensions: 3.7m x 1.6m x 1.05m
Alignment: NE/SW
Photographs G2467_209, G2467_210
Test pit TP5 was located at the northern end of TR16 (Figure 3).

The topsoil was 0.2m deep and comprised soft, loose mid brown slightly silty sand with very occasional small sub-angular and sub-rounded stones and very occasional fragments of post-medieval pottery. The subsoil comprised firmer mid brown slightly silty sand with a depth of 0.5m; beneath this was a 0.2m deep layer of yellow clayey sand. The glacial till comprised firm orange brown silty sandy clay with moderate sub-angular pebble and cobble inclusions and was encountered at a depth of 0.9m.

No archaeological activity was identified within the confines of the test pit.

5 CONCLUSION

An intensive watching brief was carried out during the geophysical ground investigations at the proposed site for the New Ysgol Bro Aberffraw Primary School, Newborough, Ynys Môn. The watching brief monitored the excavation of a soakaway and two test pits, where the topsoil was between 0.2m and 0.25m deep, the subsoil was between 0.5m and 0.6m deep, and the glacial horizon was encountered at a minimum depth of 0.75m.

The geological ground investigation works were located in close proximity to archaeological features which were identified during Phase 2 (trial trenching); however, no archaeological features were identified within the confines of the test pits or the soakaway.

6 REFERENCES

Chartered Institute for Archaeologists, 2014. *Standard and guidance for an archaeological watching brief*.

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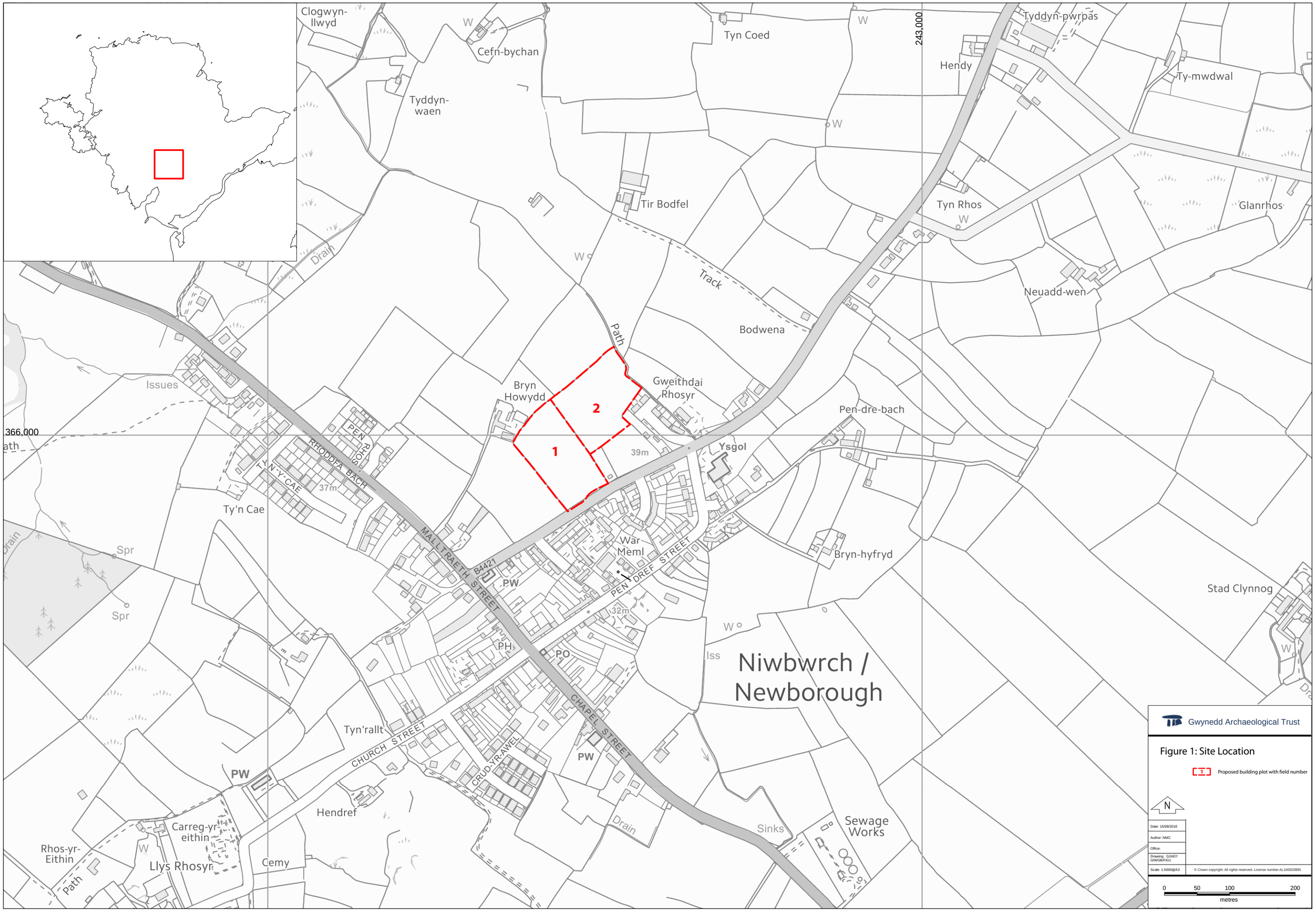
McGuinness, N. *Archaeological Trial Trenching at New Ysgol Bro Aberffraw Primary School, Newborough.* GAT Report 1329

Royal Commission on Ancient and Historic Monuments of Wales 2015 *Guidelines for digital archives.*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PEN DREF STREET
Bryn-hyfryd
32m
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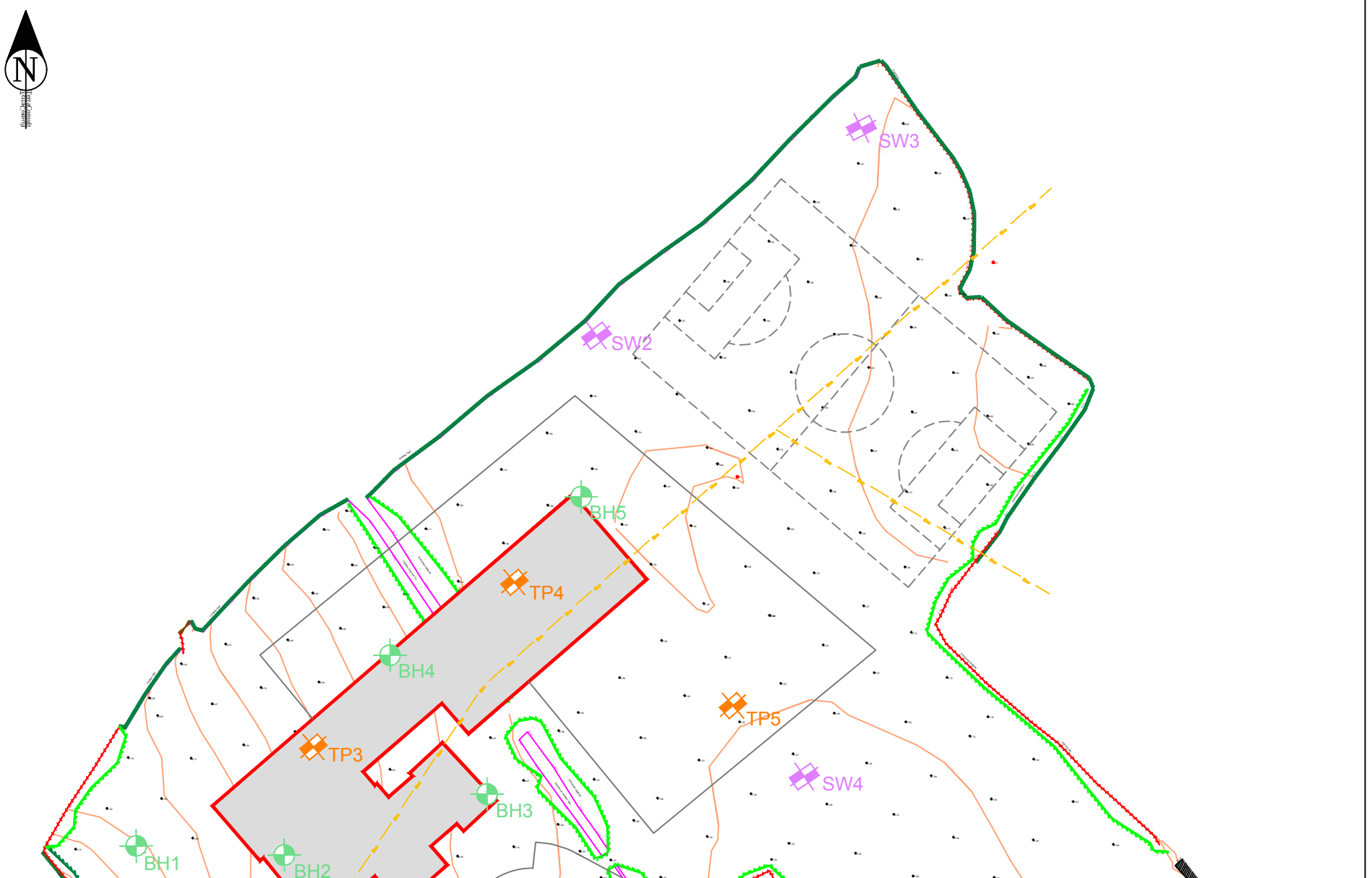
PH
PO
Niwbwrch / Newborough
Tyn'rallt
CHURCH STREET
CRUD-YR-AWEL
CHAPEL STREET
PW
PW
Hendref
Carreg-yr-eithin
Rhos-yr-Eithin
Llys Rhosyr
Cemy
Path
Drain
Sinks
Sewage Works
Gwynedd Archaeological Trust
Figure 1: Site Location
1 Proposed building plot with field number
N
Date: 15/08/2016
Author: NMC
Office:
Drawing: G2467/GIWGB/FIG1
Scale: 1:5000@A3
© Crown copyright. All rights reserved. License number AL100020895
0 50 100 200
metres



Notes

1. Do not scale
2. All dimensions are in millimeters and all levels are in meters above Ordnance Datum
3. Any anomalies on this drawing should be brought to the attention of TerraConsult Ltd

Key

- Proposed Cable Percussive Borehole
- Proposed Trial Pit with CBR Test
- Proposed Soakaway Test / Trial Pit
- Electricity Cable

TerraConsult

Bold Business Centre, Bold Lane, Sutton, St Helens WA9 4TX

Client

KIER

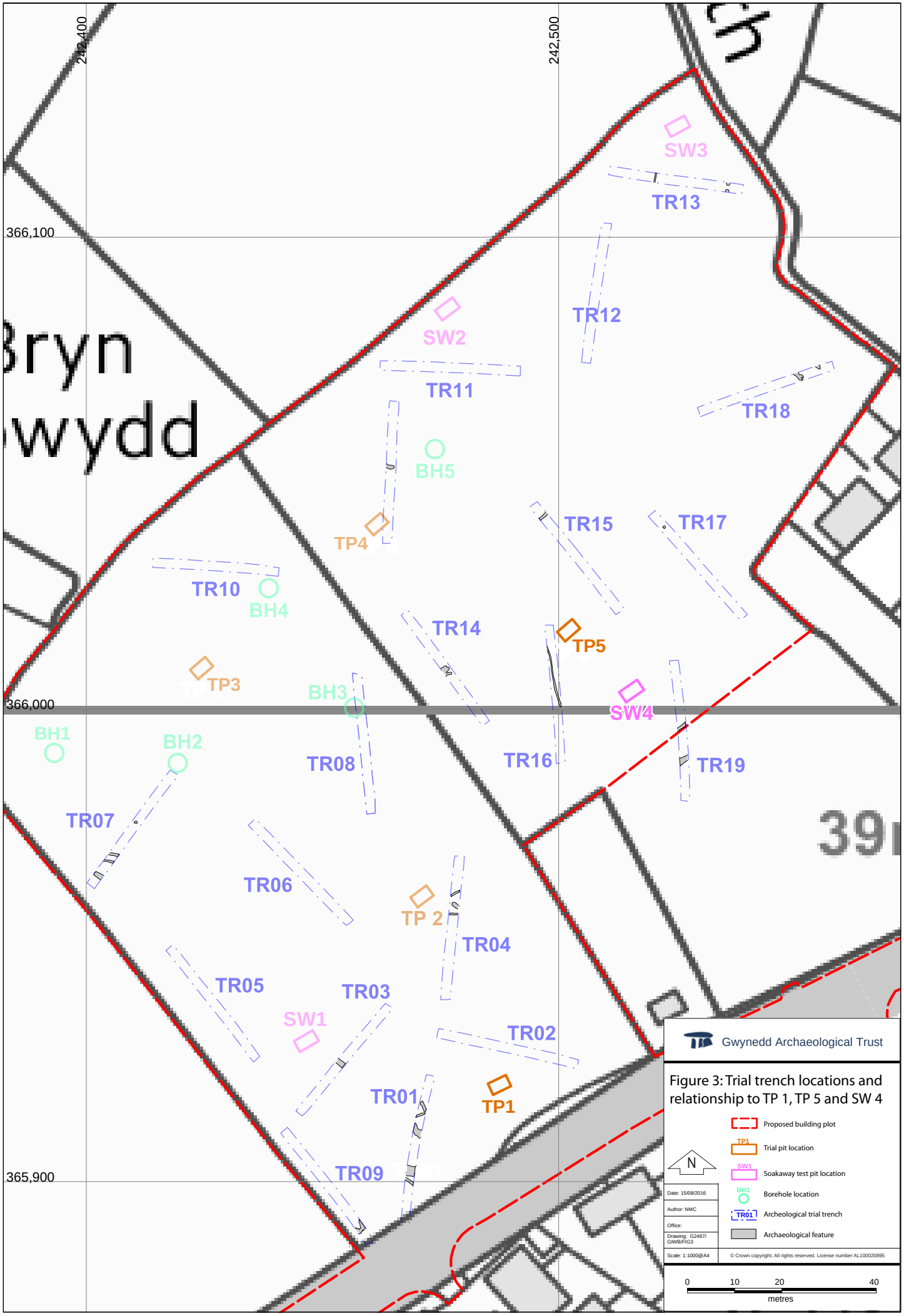
Site

Newborough PS

Title

SI Location Plan

Scale	1:1,000	@ A3	
Drawing No.	2963/1/001		
Rev	Date	Description	
File	29631001ProposedBH.dwg		
Date	08/16	Engineer	CE
Drawn	JB	Checked	DRAFT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BH5
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TR15
TR17
TR10
BH4
TR14
TP5
TP3
BH3
SW4
BH1
BH2
TR08
TR16
TR19
TR07
TR06
TP 2
TR04
TR05
TR03
SW1
TR02
TR01
TP1
TR09
Gwynedd Archaeological Trust
Figure 3: Trial trench locations and relationship to TP 1, TP 5 and SW 4
Proposed building plot
Trial pit location
Soakaway test pit location
Borehole location
Archeological trial trench
Archaeological feature
N
Date: 15/08/2016
Author: NMC
Office:
Drawing: G2467/GIWB/FIG3
Scale: 1:1000@A4
© Crown copyright. All rights reserved. License number AL100020895
0
10
20
40
metres

Plate 01: Field 2 - south west facing section Field 2 SW4 . Scale =1x1m. (Archive image: G2467_207)

Plate 02: Field 2 - length of SW4 viewed from the north west. Scales = 2x1m. (Archive image: G2467_208)

Plate 03: Field 2 - north west facing section of TP5, scale = 1x1m (Archive image: G2467_209).

Plate 04: Field 2 - length of TP5 viewed from the south west, scale = 2x1m. (Archive image: G2467_210)

Plate 05: Field 1 - north west facing section of TP1, scale = 1x1m. (Archive image: G2467_211

Plate 06: Field 1 - length of TP1 viewed from the south west, scale = 2x1m. (Archive image: G2467_212)

7 APPENDIX I

Reproduction of the Gwynedd Archaeological Trust project design for an archaeological watching brief

NEW YSGOL BRO ABERFFRAW PRIMARY SCHOOL, NEWBOROUGH, ANGLESEY

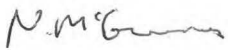
PROJECT DESIGN FOR AN ARCHAEOLOGICAL WATCHING BRIEF (G2467)

Prepared for

Cyngor Sir Ynys Môn

August 2016

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

Approvals Table				
	Role	**Printed Name**	**Signature**	**Date**
Originated by	Document Author	Neil McGuinness		19/08/16
Reviewed by	Document Reviewer	John Roberts		19/08/16
Approved by	Principal Archaeologist	John Roberts		19/08/16

Revision History			
Rev No.	**Summary of Changes**	**Ref Section**	**Purpose of Issue**
1	Removal of GAPS email correspondence from Appendices, removal of requirement to watch CBR1 and CBR5		Comments by GAPS

All GAT staff should sign their copy to confirm the project specification is read and understood and retain a copy of the specification for the duration of their involvement with the project. On completion, the specification should be retained with the project archive:

Name	Signature	Date

NEW YSGOL BRO ABERFFRAW PRIMARY SCHOOL, NEWBOROUGH, ANGLESEY
PROJECT DESIGN FOR AN ARCHAEOLOGICAL WATCHING BRIEF
Prepared for *Cyngor Sir Ynys Môn,* August 2016

CONTENTS

1 INTRODUCTION

Gwynedd Archaeological Trust (GAT) has been asked by *Cyngor Sir Ynys Môn* to undertake a watching brief during geological ground investigation works at the proposed site for the New Ysgol Bro Aberffraw Primary School, Newborough, Anglesey (NGR SH4247566010). The site is currently a greenfield site, consisting of two fields set aside for pasture (Figure 1).

The watching brief will be conducted during geological ground investigation (GI) works to be carried out by at the site by TerraConsult Ltd between Monday 22nd August and Tuesday 23rd August 2016 (Figure 2; Appendix I, Appendix II). The GI works will comprise the digging of:

- 5 cable percussive boreholes (CBR) to prove rockhead (BH 1-5 on Figure 2);
- 5 trial pits with CBR determinations by plate load test (TP 1-5 on Figure 2); and
- 4 soakaway tests in accordance with BRE 365 (SW 1-4 on Figure 2).

A geophysical survey and desk-based assessment were undertaken in May 2016 by Gwynedd Archaeological Trust (GAT 2016) and the results of these were used to locate trenches for a programme of trial trenching undertaken in July 2016 (Figure 3). A total of 20 trenches were excavated within the two fields (Figure 3, TR01-20). The results of the trial trenching (McGuinness 2016, in press) indicate the presence of a stone walled building represented on 18th century maps, both at the south end of TR01 and the southeast end of TR09 in the southwest corner of Field 1. A possible prehistoric ditch was encountered in TR19, Field 2 within an area of potential prehistoric activity indicated by the geophysical survey results.

Gwynedd Archaeological Planning Service (GAPS) have requested that an archaeological watching brief be conducted during GI works in the vicinity of these two areas of archaeological interest. This will involve the monitoring of 4 elements of the works:

Monday 22nd August	The digging of soakaway SW 4 in Field 2.
Tuesday 23rd August	The digging of test pit TP 1 in Field 1; The digging of test pit TP 5 in Field 2; and Repeat works in soakaway SW 4 in Field 2 if further ground disturbance is involved.

The scheme will be monitored by GAPS. This design and all future reporting will need to be approved by GAPS.

The archaeological watching brief will conform to the guidelines specified in *Standard and Guidance for an archaeological watching brief* (Chartered Institute for Archaeologists, 2014).

2 SITE LOCATION AND GEOLOGY

The site is currently a greenfield site, consisting of two fields set aside for pasture and covering an area of approximately 28,571 m2. It is located on the northeastern edge of the town of Newborough, on Anglesey (NGR SH4247566010). The fields are bounded by further pasture land to the north, east, and west; by a farm to the northwest; housing to the southeast; and a road to the south (Figure 1).

The results of the trial trenching programme showed that the average (mean) minimum depth below ground level at which natural glacial drift geology was encountered across the 20 trenches was 0.72m. Solid geology was not encountered in any of the trenches. The drift geology tended to consist of stoney, sandy clays (till) (McGuinness 2016, in press).The underlying solid geology is comprised of Central Anglesey Shear Zone and Berw Shear bedrock (British Geological Survey, Geology of Britain Viewer).

3 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

A desk-based assessment, walkover survey, and geophysical survey was carried out by Gwynedd Archaeological Trust in May 2016 (Phase 1) (GAT 2016), followed by a programme of archaeological trial trenching by GAT in July 2016 (Phase 2) (McGuinness 2016, in press). A brief summary of the results of the two phases of investigation are included below.

The desk-based assessment identified that the site lay to the north of the historic core of the medieval town of Newborough, but within an area that was likely to have formed part of the town fields, with evidence of medieval strip fields having been identified in close proximity to the site. The site was identified as having been the property of Lord Boston's Lligwy estate from at least the latter part of the 18th century. A Lligwy estate map of 1782 shows a house and associated paddock in the south west of the assessment area, which is not shown on any later mapping. The Ordnance Survey maps of the later 19th and early 20th centuries shows the current area boundary, along with additional hedgerows that have been grubbed out in recent times. There appears to be a palimpsest of former field boundaries which were formerly present on the site.

The desk-based assessment identified how the field system around the town of Newborough, including those within the area of the development is probably largely medieval in origin (Johnstone 1997). Some of the strips of the open fields are preserved in the modern boundaries and even where the fields are fairly large and rectangular their alignment probably reflects the orientation of the open field strips. The walkover survey further underlined this by identifying gentle undulations in the fields that are suggestive of former field boundaries and possible ridge and furrow agriculture.

The geophysical survey noted interference in two parts from strongly magnetic bedrock, indicating significant interference from the sub-surface geology, which was not visible on the surface. Linear anomalies were also identified, some of which probably represent field boundaries shown on the historic mapping and aerial photographs. Further linear anomalies probably represent field drains, and a former trackway was identified. A probable former small quarry was noted in the northwest corner of the site.

Twenty trenches measuring 30x2m, each excavated to drift geological or archaeological horizons, were excavated at the site in July 2016 (Figure 3). Archaeological features were encountered in 13 of the 20 trenches. The results of the trial trenching (McGuinness 2016, in press) revealed evidence suggesting activity at the site from the prehistory through to the present day. The majority of the features encountered appear to be the remains of field boundary ditches and banks.

Two areas of the site revealed archaeological evidence of particular interest:

- The location of a possible stone walled building, possibly that represented on the 1782 Lligwy estate map. This was encountered in the south end of TR01 and the southeast end of the adjacent TR09 in the southwest corner of Field 1. This area is located to the southwest of the proposed location of TP 1.

- A 1.17m wide, 0.51m deep, possible prehistoric ditch cutting northeast-southwest across TR19, Field 2. This feature lies within an area of potential prehistoric activity indicated by the geophysical survey results and its extent is uncertain. This area is located to the southeast of TP 5 and SW 4.

4 METHODOLOGY

4.1 Watching Brief

(Reproduced from Chartered Institute for Archaeologists 2014, *Standard and Guidance for an Archaeological Watching Brief*)

The definition of an archaeological watching brief is a formal programme of observation and investigation conducted during any operation carried out for non-archaeological reasons where there is a possibility that archaeological deposits may be disturbed or destroyed. The programme will result in the preparation of a report and ordered archive.

An archaeological watching brief is divided into four categories according the Institute for Archaeologists Standard and Guidance for an archaeological watching brief:

- comprehensive (present during all ground disturbance)
- intensive (present during sensitive ground disturbance)
- intermittent (viewing the trenches after machining)
- partial (as and when seems appropriate).

A specific watching brief category has not been specified in any GAPS correspondence. In an e-mail dated 8th August 2016, GAPS state that they "…would recommend that both TP 5 and SW 4 are subject to a watching brief". It is therefore recommended by GAT (further to GAPS approval) that an **intensive** watching brief is carried out with a GAT archaeologist present during the following elements of the GI works:

Monday 22nd August

- The digging of soakaway test pit SW 4 in Field 2 (approximately centred on SH4251566003)

Tuesday 23rd August

- The digging of test pit TP 1 in Field 1 (approximately centred on SH4248765920) ;
- The digging of test pit TP 5 in Field 2 (approximately centred on SH4250266016); and
- Repeat works in soakaway test pit SW 4 in Field 2 if further ground disturbance is involved.

The watching brief will be carried out during the excavation of the trial pits TP 1 and TP 5 and soakaway test pit SW 4 (Figure 3). This will involve the excavation of pits with a mechanical excavator (for full details of the proposed methodologies to be employed by TerraConsult Ltd see the Construction Phase Plan Appendix I).

GAT will be in regular contact with the client and/or contractor to confirm the works programme and schedule. GAPS will be informed of any changes to working methodology from those outlined above and in the TerraConsult Ltd Construction Phase Plan (Appendix I).

4.2 Basic watching brief methodological procedures

4.2.1 Watching Brief

- All attendances and identified features will be recorded using GAT watching brief pro-formas (Appendix III; Appendix IV)

- Photographic images will be taken using a digital SLR (Nikon D3100) camera set to maximum resolution (4,608 × 3,072 14.2 effective megapixels) in RAW format and will be converted to TIFF and JPEG format for archiving using Adobe Photoshop; a photographic record will maintained on site using GAT pro-formas (Appendix V) and digitised in *Microsoft Access* as part of the fieldwork archive and dissemination process; photographic reference numbers will continue the sequence already started for previous phases of works at the site; the first reference number to be used for this phase of works is **G2457_207**.

- Any subsurface remains will be recorded photographically, with detailed notations and a measured survey.

- All archaeological features/deposits encountered will be manually cleaned and examined to determine extent, function, date and relationship to adjacent features. If discrete features such as pits, postholes or ditches are encountered, the following excavation methodology will apply: 50% sample of individual sub-circular features, 10% sample of individual linear features. Any large-scale or more detailed excavation required will be detailed in an appropriate **Further Archaeological Works Design**.

- The location of soakaway test pit SW 4, and trial pits TP 1 and TP 5 will be recorded using a survey grade GPS with <1cm accuracy (model: Trimble GNSS/R6/5800). If hand drawn scaled plans are not created, the extent of any archaeological features identified within the soakaway and trial pits and the location of drawing endpoints will also be recorded using the survey grade GPS.

- All sections to be drawn at a minimum 1:10 scale. This will include the profiles/sections of any earthworks truncated or removed during the GI works. Sections will be drawn on GAT pro-forma permatrace.

- All plans to be at a minimum 1:20 scale. Plans will be drawn on GAT pro-forma permatrace.

- Should dateable artefacts and ecofacts be recovered, an interim report will be submitted summarising the results, along with an assessment of potential for analysis specification (in line with the MAP2 process).

4.3 Environmental samples

It is possible that features suitable for environmental sampling will be identified with a view to recovering micro and macrobotanical remains. Environmental samples will be taken from sealed contexts, with bulk samples from ditches and pit fills proposed as not less than 10 litres from each context. The sampling strategy will be undertaken in accordance with the principles set out in *Environmental Archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation* (English Heritage, 2011). Recourse will be made to relevant specialists for palaeo-environmental analysis and dating. Any required specialists will be consulted during the watching brief to advise GAT on a sampling strategy.

4.4 Human Remains

No evidence of human remains were recovered during the trial trenching programme, and it is not expected that human remains will be encountered. However, should any finds of human remains be encountered, they will be left in-situ, covered and protected, and the coroner and GAPS informed. If removal is necessary it will take place under appropriate regulations and with due regard for health and safety issues. In order to excavate human remains, a Ministry of Justice licence is required under Section 25 of the Burials Act 1857 for the removal of any body or remains of any body from any place of burial. This will be applied should human remains need to be investigated or moved.

4.5 Small Finds

Diagnostic artefacts recovered will be retained for further examination and identification. Pottery sherds of 19th and 20th century date will be examined on site and the context from which they were retrieved noted but the sherds will not be retained. The artefacts will be treated according to guidelines issued by the UK Institute of Conservation (Leigh and Watkinson 2001) in particular the advice provided within First Aid for Finds (Leigh and Watkinson 1998) and Historic England (2015).

All finds are the property of the landowner; however, it is Trust policy to recommend that all finds are donated to an appropriate museum, in this case Oriel Ynys Mon, where they can receive specialist treatment and study. Access to finds must be granted to the Trust for a reasonable period to allow for analysis and for study and publication as necessary. Trust staff will undertake initial identification, but any additional advice would be sought from a wide range of consultants used by the Trust, including National Museums and Galleries of Wales at Cardiff.

4.5.1 Unexpected Discoveries: Treasure Trove

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

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

The following types of finds are not treasure:

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

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

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

4.6 Further Archaeological Works

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

The application of a further archaeological works design (FAWD) will be dependent on the initial identification, interpretation and examination of an archaeological feature and the identification of activity that cannot be addressed within the provisions of the current design, e.g., structures. The requirement for an FAWD will be determined in conjunction with GAPS through established communication lines and the monitoring process.

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

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

The FAWD document will need to be approved by GAPS.

4.7 Monitoring Arrangements

The GAPS Archaeologist will need to be informed of the project start date and of the subsequent progress and findings. This will allow the GAPS Archaeologist time to arrange monitoring visits, attend site meetings (if required) and enable discussion about the need or otherwise for FAWDs (if required) as features of potential archaeological significance are encountered.

GAPS contact details:

Senior Planning Archaeologist: **Ashley Batten**
Tel: 01248 370926 Email: ashley.batten@heneb.co.uk
Mobile: **07920 264232**

Planning Archaeologist: **Jenny Emmett**
Tel: 01248 370926 Email: jenny.emmett@heneb.co.uk
Mobile: **07824 481052**

4.8 Fieldwork Archiving

Following the completion of the watching brief, a programme of field work archiving will be completed based on following task list;

1. Pro-formas: all cross referenced and complete;
2. Photographic Metadata: completed in *Microsoft Access* and cross-referenced with all pro-formas;
3. Sections: all cross referenced and complete;
4. Survey data: downloaded using a Computer Aided Design package imported into a GIS shapfile;
5. Plans (if relevant): all cross referenced and complete;
6. Artefacts (if relevant): quantified and identified; register completed;
7. Ecofacts (if relevant): quantified and register completed;
8. Context register (if relevant): quantified and register completed;

All data will be processed, final illustrations will be compiled and a report will be produced which will detail and synthesise the results. Location drawings and a sample of relevant photographs will be used to illustrate the reports.

5 REPORT AND DISSEMINATION

Following completion of the record as outlined above, a report will be produced incorporating the following:

- Non-technical summary
- Introduction
- Project Design
- Methods and Techniques
- Watching Brief Results
- Summary and Conclusions
- Bibliography of sources consulted

The report will be submitted to GAPS by late September 2016.

Illustrations, including plans and photographs, will be incorporated within the report at an appropriate scale.

A full archive including plans, photographs, written material and any other material resulting from the project will be prepared in accordance with English Heritage's MoRPHE 2006 document. All plans, photographs and descriptions will be labelled and cross-referenced, and lodged in an appropriate place (to be decided in consultation with the regional Historic Environment Record) within six months of the completion of the project. All digital data will be written to CD-ROM and stored with the paper archive.

- One or more copies (as required) will be sent to the client

- One or more copies (as required) will be sent to the GAPS

- One or more copies (as required) sent to the regional Historic Environment Record Archaeologist for the area (HER, Gwynedd Archaeological Trust, Craig Beuno, Garth Road, Bangor, LL57 2RT);

- Submission of digital information to the Royal Commission on the Ancient and Historical Monuments of Wales shall be undertaken in accordance with the RCAHMW Guidelines for Digital Archives Version 1 (2015). Digital information will include the photographic archive and associated metadata.

- Artefacts recovered from the site during the watching brief, with the landowner's permission, will initially be transferred to GAT and then subsequently to Oriel Ynys Mon. If artefacts are transferred to Oriel Ynys Mon, this must be in accordance with the Oriel Ynys Mon – Guidelines for the preparation and deposition of archaeological archive (2012).

- Dependent on the results of the watching brief, a summary note or a specific article will be included in the Council for British Archaeology Wales publication *Archaeology in Wales*. This shall be agreed with GAPS and client in advance of publication along with all publication content. GAPS involvement in the project will be acknowledged therein.

5.1 Historic Environment Record

In line with the regional Historic Environment Record (HER) requirements, the HER must be contacted at the onset of the project to ensure that any data arising is formatted in a manner suitable for accession to the HER. At the onset, the HER Enquiry Form provided by the HER, will be completed and submitted.

6 STAFF AND TIMETABLE

6.1 Staff

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

Gwynedd Archaeological Trust's Equal Opportunity Policy aims to treat everyone equally and to ensure that no job applicant, employee, worker or clients are discriminated against on the grounds of a protected characteristic as defined by the Equality Act 2010.

6.2 Timetable

The fieldwork is scheduled to take place in August 2016 (Appendix II), with the report to be submitted to GAPS by the end of September 2016.

7 HEALTH & SAFETY

The GAT Project Archaeologist will be CSCS certified. Copies of the site specific risk assessment will be supplied to the client and site contractor prior to the start of fieldwork. Any risks and hazards will be indicated prior to the start of work via a submitted risk assessment. **The GAT archaeologist will also abide by the TerraConsult Risk Assessment set out in Appendix I**. All staff will be issued with required personal safety equipment, including high visibility jacket, steel toe-capped boots and hard hat.

8 INSURANCE

Public Liability

Limit of Indemnity- £5,000,000 any one event in respect of Public Liability

INSURER Aviva Insurance Ltd
POLICY TYPE Public Liability
POLICY NUMBER 24765101 CHC/000405
EXPIRY DATE 22/06/2017

Employers Liability

Limit of Indemnity- £10,000,000 any one occurrence.

INSURER Aviva Insurance Ltd
POLICY TYPE Employers Liability
POLICY NUMBER 24765101 CHC/000405
EXPIRY DATE 22/06/2017

Professional Indemnity

Limit of Indemnity- £2,000,000 in respect of each and every claim

INSURER Hiscox Insurance Company Limited
POLICY TYPE Professional Indemnity
POLICY NUMBER HU PI 9129989/1208
EXPIRY DATE 23/07/2017

9 REFERENCES

Chartered Institute for Archaeologists, 2014. *Standard and guidance for an archaeological watching brief*.

English Heritage, 1991. *Management of Archaeological Projects* (MAP2).

English Heritage, 2011. *Environmental Archaeology: a guide to the theory and practice of methods, from sampling and recovery to post-excavation*

GAT *2016 New Ysgol Bro Aberffraw Primary School, Newborough, Anglesey: Archaeological Assessment and Geophysical Survey: Phase 1 Field Evaluation*. Unpublished GAT report # 1318.

Historic England, 2015. *Management of Research Projects in the Historic Environment* (MoRPHE).

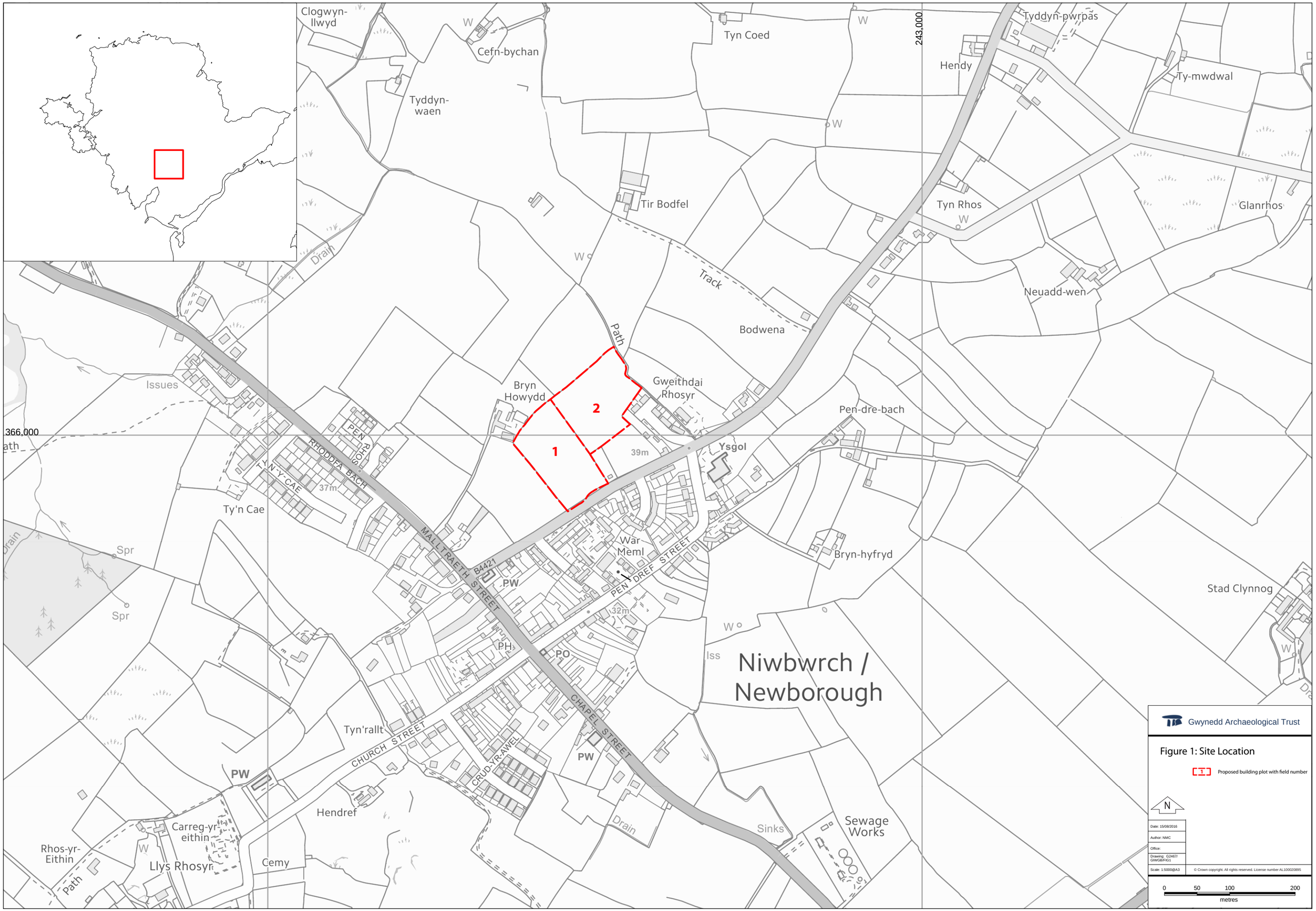
Leigh, D. and Watkinson, D. 1998*. First Aid for Finds: Practical Guide for Archaeologists*.

Leigh, D. and Watkinson, D. 2001. *UK Institute for Conservation: Excavated Artefacts and Conservation.*

Johnstone, N. 1997 'An Investigation into the Location of the Royal Courts of Thirteenth-Century Gwynedd' in Edwards, N. (ed.) *Landscape and Settlement in Medieval Wales* (Oxbow Monograph 81).

McGuinness, 2016 (in press), *Archaeological Trial Trenching at New Ysgol Bro Aberffraw Primary School, Newborough*

Royal Commission on Ancient and Historic Monuments of Wales 2015 *Guidelines for digital archives.*


Clogwyn-llwyd
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Tyn Coed
Tyddyn-pwrpas
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War Meml
PEN DREF STREET
Bryn-hyfryd
32m
Stad Clynnog
PH
PO
Niwbwrch / Newborough
Tyn'rallt
CHURCH STREET
CRUD-YR-AWEL
CHAPEL STREET
PW
PW
Hendref
Carreg-yr-eithin
Rhos-yr-Eithin
Llys Rhosyr
Cemy
Path
Drain
Sinks
Sewage Works
Gwynedd Archaeological Trust
Figure 1: Site Location
1 Proposed building plot with field number
N
Date: 15/08/2016
Author: NMC
Office:
Drawing: G2467/GIWGB/FIG1
Scale: 1:5000@A3
© Crown copyright. All rights reserved. License number AL100020895
0 50 100 200
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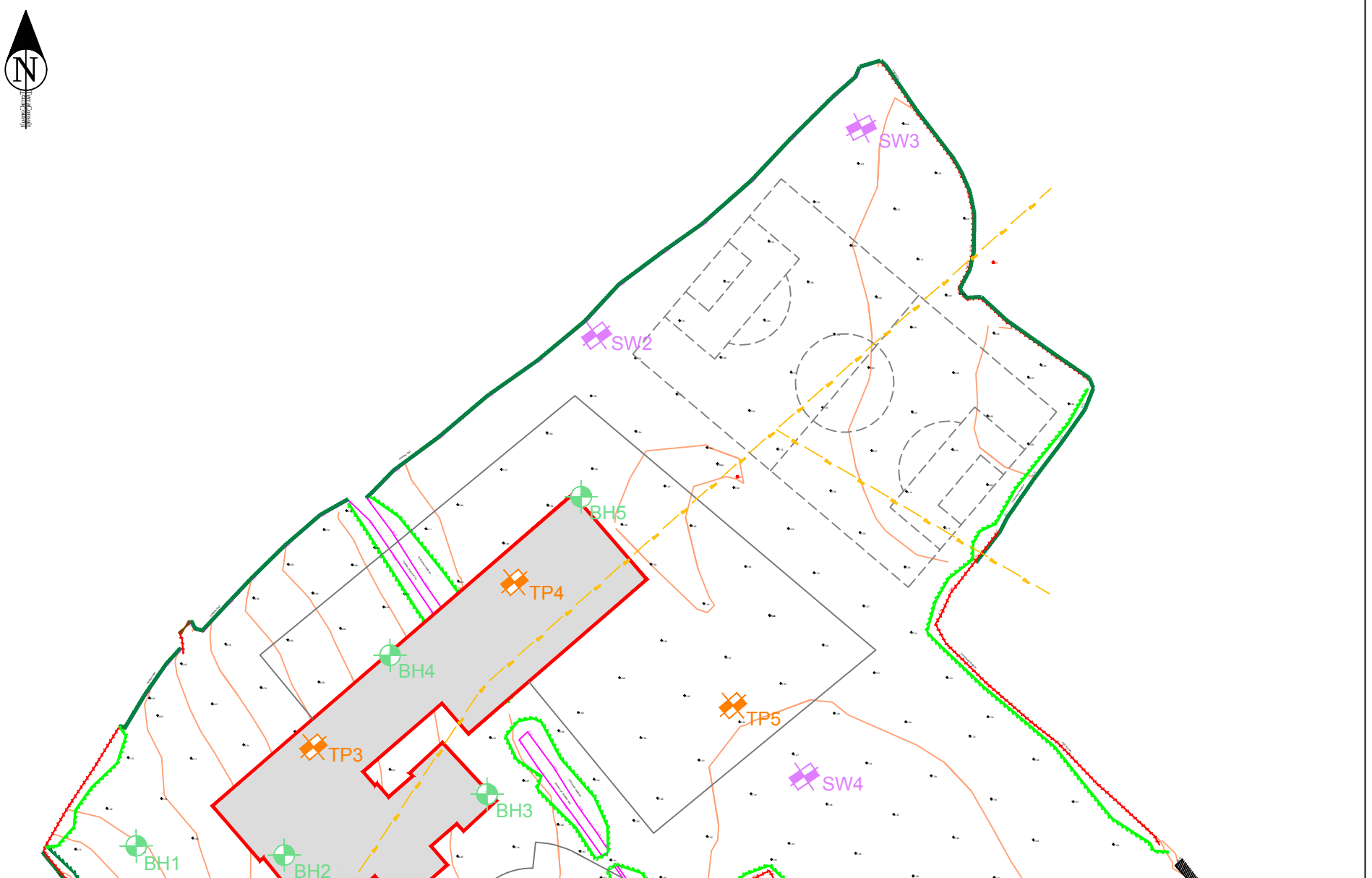


Notes

1. Do not scale
2. All dimensions are in millimeters and all levels are in meters above Ordnance Datum
3. Any anomalies on this drawing should be brought to the attention of TerraConsult Ltd

Key

- Proposed Cable Percussive Borehole
- Proposed Trial Pit with CBR Test
- Proposed Soakaway Test / Trial Pit
- Electricity Cable

TerraConsult

Bold Business Centre, Bold Lane, Sutton, St Helens WA9 4TX

Client

KIER

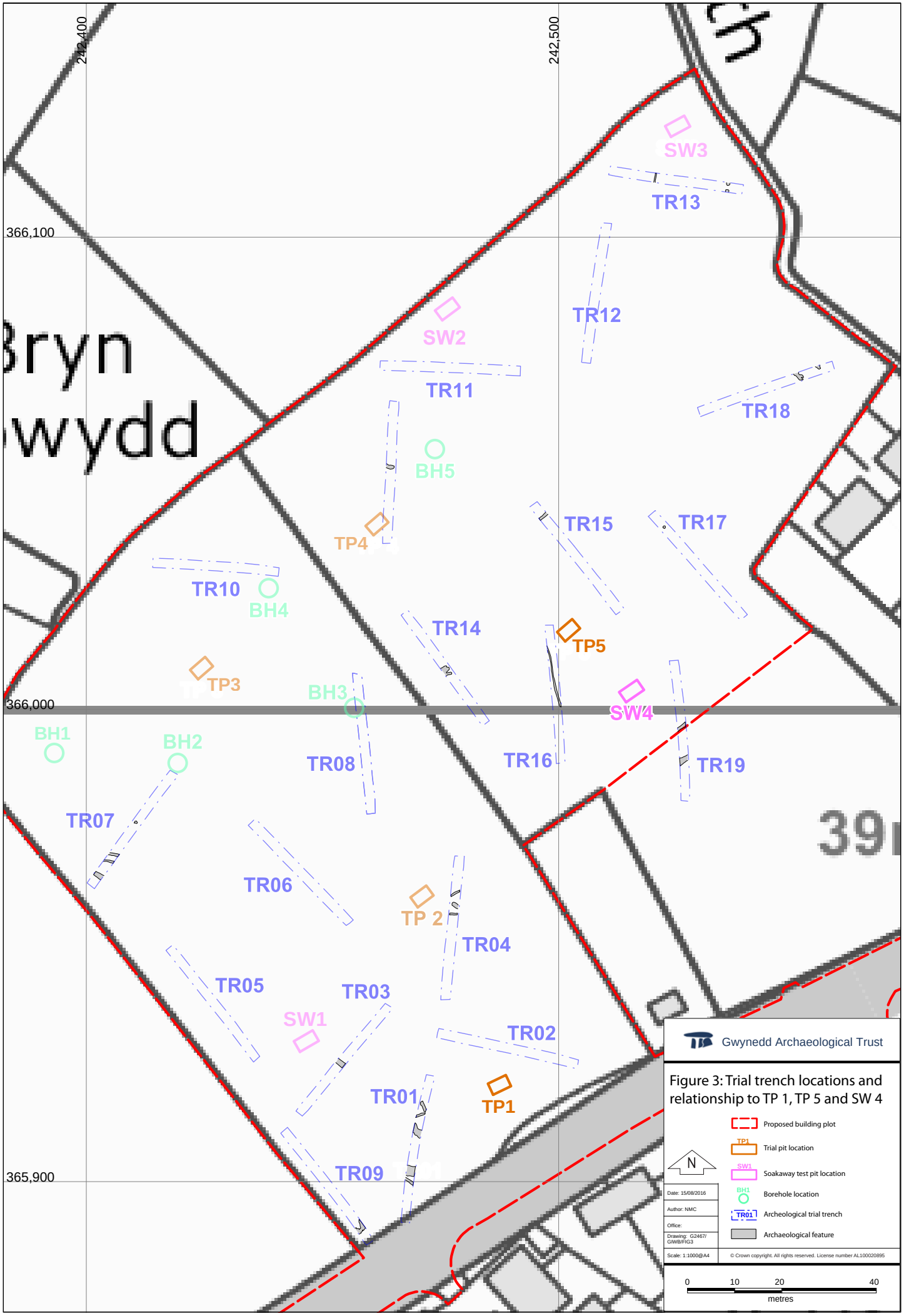
Site

Newborough PS

Title

SI Location Plan

Scale	1:1,000	@ A3	
Drawing No.	2963/1/001		
Rev	Date	Description	
File	29631001ProposedBH.dwg		
Date	08/16	Engineer	CE
Drawn	JB	Checked	DRAFT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TP5
TP3
BH3
SW4
BH1
BH2
TR08
TR16
TR19
TR07
TR06
TP 2
TR04
TR05
TR03
SW1
TR02
TR01
TP1
TR09
Gwynedd Archaeological Trust
Figure 3: Trial trench locations and relationship to TP 1, TP 5 and SW 4
Proposed building plot
Trial pit location
Soakaway test pit location
Borehole location
Archeological trial trench
Archaeological feature
N
Date: 15/08/2016
Author: NMC
Office:
Drawing: G2467/GIWB/FIG3
Scale: 1:1000@A4
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0
10
20
40
metres

Appendix I TerraConsult Construction Phase Plan

Construction Phase Plan

Planning	Project:	Ysgol Bro Rhosyr, Newborough			
	Project No:	2963			
	Name and address of Client:	Kier Business Services Ltd Station House 1st Floor, Exchange Station Tithebarn Street Liverpool L2 2QP			
	Name and contact details of Principal Designer (PD):	Kier Business Services Ltd Station House 1st Floor, Exchange Station Tithebarn Street Liverpool L2 2QP TCL Principal Designers for GI **ONLY**			
	Project outline:	5 Cable percussive boreholes to prove rockhead 5 trial pits with CBR determinations by plate load test 4 soakaway tests in accordance with BRE 365			
	Significant hazards identified by Client or PD:	Overhead electricity cables			
	Where are the toilet and washing facilities?	Mobile unit to be delivered for start of works			
	Key dates:	Start:	22/08/16	Finish:	26/08/16

Liaison on site	Who else is on site and their contact details:	1. 2. 3.
	How will we keep them updated during the works (site supervisor)?	

Site rules:

At all times while on site, you are required to wear as a minimum:

- Long trousers
- Short sleeved shirt
- Lace up safety boots with ankle support, midsole and toe protection unless conditions dictate the need for wellingtons. Rigger boots are NOT acceptable.
- A minimum of a hi visibility vest to BS EN471, class 2

CSCS Cards:

Everyone attending site must be in possession of a CSCS card, appropriate to the role undertake. If you do not have a CSCS card then you must be accompanied by a CSCS cardholder at all times.

Mobile telephones:

Due to the potential for distraction, no mobile phones are to be used on site for conversations unless used in a place designated as safe and for the purpose. If no such place has been designated, then this will be deemed to be the site office.

Mobile phones **MUST NOT** be used while operating any type of vehicle.

Welfare, hygiene and smoking:

Food and drink are only to be consumed in designated areas such as site offices, to prevent ingestion of substances and contaminants.

All sites are no smoking, except in areas designated for the purpose.

Accidents and incidents:

It is your responsibility to report any accidents, incidents or near misses – no matter how small. These should be reported to the site supervisor.

Construction Phase Plan

Organise	**What are the main dangers on this site (strike out those not present)?**	**Briefly outline controls:**
	Utilities (overhead or underground):	Ensure service drawings are available; Locate services; Refer to 'RA9 Above Ground Services' and TC-SI-3015-Services-Overhead' appended below. Extra care to be taken when maneuvering beneath cables. Minimum of 15m distance between plant and cables.
	Collapse of excavations:	Do not enter; Shore excavations if entry required
	Failure of plant and equipment:	LOLER certificates / service records current; NVQ or CPCS to be held and equipment guarded
	Exposure to asbestos:	Stop work if uncovered.
	Risks to members of the public and others:	Site will be secure.
	Exposure to building dusts:	N/A
	Moving vehicles:	Provide barriers around working areas and walkways; Vehicle marshals if reversing; hi vis to be worn
	Falls from height:	No working at height on this project
	Site contaminants:	Ensure everyone on site is aware of any contamination- only anticipated to be possibly present in BH01. Wear disposable nitrile gloves; Follow good hygiene; No eating, drinking or smoking
	Other issues:	1. Archaelogical watching brief to be undertaken at TP1, TP5 and SW4. 2. 3. 4.

Risk Assessment Key

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The Initial & Residual RISK RATINGS are calculated by the formula:

Risk = Severity x Likelihood

Likely **severity of** harm, use five categories:

0 No consequences to health, safety or welfare.
1 Minor injury (cuts, abrasions etc. requiring first aid).
2 Injury leading to hospital treatment, broken minor bone not reportable.
3 Injury leading to 3 days absence or more, reportable under RIDDOR such as a broken major bone, dislocation etc.
4 Serious injury, disease etc. leading to long term absence, disability injury or injury / disease leading to loss of livelihood.
5 Death or multiple fatalities.

Likelihood that harm will occur, use five categories:

0 Will not occur.
1 Very unlikely to occur.
2 Occasional occurrence.
3 Likely to occur – even chance.
4 Very likely to occur.
5 Will occur.

Risk Rating:

1 – 2 Negligible
3 – 7 Acceptable providing risk is managed
8 – 12 Avoid if reasonably practicable/ apply risk control
13 – 25 Unacceptable risk – apply risk control

LIKELIHOOD THAT HARM WILL OCCUR	SEVERITY OF HARM					
	0	1	2	3	4	5
	1	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	20
	5	5	10	15	20	25

Hierarchy of Risk Control:

Eliminate activity or hazard
Reduce
Prevent contact
Safe systems of work
Personal protective equipment

Note: All Geo-environmental risk assessments are to be carried out in a slightly different format (a 4 x 4 matrix) as set out in CIRIA Report C552 (2000) and as summarised in standard Appendix B for all geo-environmental reports.

Risk Assessment RA1: Cable percussion drilling rig

TerraConsult

Project:	RA1: Cable percussion drilling rig iss 3			Project No:	NA
Author:	Tom Phillips CMIOSH	Signature:	Tom Phillips	Date:	24/11/2015
Checker:	D Daniels	Signature:	DDaniels	Date:	06/01/2016
Approver:	C S Eccles	Signature:	C S Eccles	Date:	08/01/2016

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
1	Rig collapse	Everyone on site	5	3	15	Rig to be erected in accordance with manufacturers instruction. All support bars, side stays to be correctly fitted. Rig to be LOLER assessed correctly (12 months). Drillers to be in possession of NVQ2 in land drilling. Refer to cable tool checklist.	Drilling contractor / site supervisor	5	2	10
2	Failure of lifting accessories	Everyone on site	5	3	15	All drilling accessories (shackles, swivels, sinker bars etc.) to have been subjected to individual LOLER assessments - 6 monthly.	Drilling contractor / site supervisor	5	2	10
3	Work at height	Everyone working near rig	5	4	20	No work at height beyond the fitting of side stays allowed. Contractors to use electric winch for erection, fit jump bars and whip check and secondary blocking out rope to remove the need to work at height, so far as practicable. Refer to cable tool checklist.	Drilling contractor / site supervisor	5	2	10

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
4	Injury from physical hazards	Everyone working near rig	5	3	15	Working area to be kept clear of non essential personnel. Barriers may be required to prevent access to members of the public etc. All personnel in the working area to wear a hard hat and safety boots with toe and midsole protection.	Drilling contractor / site supervisor	5	2	10
5	Contact with rotating components	Everyone working near rig	4	3	12	Drilling rig to be guarded in accordance with the guidance in the rotary drilling rig cheklist.	Drilling contractor / site supervisor	4	2	8
6	Contact with mechanical hazards during drilling and testing	Assistant driller	4	3	12	Assistant driller to remain clear of moving tools as far as reasonably practicable except where his presence is required to assist in the connection of casing and rods and the manouvering of drilling tools in cooperation with the lead driller. SPT hammers to be free of ropes and weight to fall under own mass. U100 and other tools to be removed only when tooling is lying down.	Drilling contractor / site supervisor	4	2	8
7	Noise	Everyone working near rig	3	4	12	All employees working near the drilling rig will wear hearing protection which will provide a minimum of 15dB attenuation.	Drilling contractor / site supervisor	3	2	6

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
8	Contact with underground services	Everyone working near rig	5	3	15	Drawings of utilities to be provided for all sites. Services in the area will be located and the area of work will be checked with a CAT before work starts. Operator to be in posession of a formal training certificate for the CAT.	Site supervisor	5	1	5

-1.0 SCOPE

To define the processes involved in cable percussion boring and sampling.

2.0 DEFINITIONS

Cable percussion boring is carried out by a minimum of a two man crew. The crew consists of a Lead Driller, who will be NVQ Level 2 qualified and/or be BDA accredited and a driller (aka Second Man)

The Logging Engineer/Geologist will be an experienced person who has undergone appropriate training in safety and technical training. The Logging Engineer/Geologist and Site Supervisor may be in certain circumstances be the same person.

3.0 SAFETY

The TerraConsult Limited Policy Statements and Health & Safety Manual and contract specific Project Plan is produced for each contract undertaken and defines the management structure and the risks associated with the operations in which it is engaged. The document which is retained on site at all times and confirms that health, safety and the protection of the environment are **management responsibilities.**

The document, which was originally written to comply with obligations imposed by Section 3(3) of the Health and Safety at Work Act 1974, have been revised to incorporate the requirements of new legislation, notably the Construction (Design and Management) Regulations 2015 (C.D.M).

Safety Equipment : All rigs are fitted with guards around the moving parts of the hammer to comply with manufacturers' specification.

Personal Protective Equipment : Hard hats, steel toe caps, ear protection and protective gloves will be worn at all times when in the vicinity of the rig during boring or other working operations.

Underground Services : Unless cleared by TerraConsult all boreholes will be commenced with a hand dug inspection pit to 1.20m before boring commences. Any uncertainty will be reported to TerraConsult before continuing – See TerraConsult Method Statement TC-SI- 3016 (Services Buried).

Working Areas : Working areas will be kept as free as practical from borehole arisings and equipment not actually in use. Particular attention being paid to reduction of "trip" hazards.

Protection of Others : Protection will be given where there is a risk of injury to the general public, other staff involved with the works or livestock. Protection will be appropriate to the conditions and in compliance with the Specification. Barriers, screening or fencing appropriate to the location will be erected.

Pollution/Environment : All reasonable efforts will be made to protect the environment and avoid pollution of the air, land and water courses. Spillage of soil or water will be contained or diverted in such a manner as not to cause a hazard to the general public. A bentonite seal will be placed at the base of any contaminated Made Ground to prevent downward migration of contaminants. Any potentially contaminated spoil will be bagged and left separate for controlled off-site disposal. Plant will be maintained in good working order. Drip trays or other methods of controlling fuel or oil spillage from plant will be employed.

Nuisance : Nuisance to others will be minimised within the constraints of the project requirements.

Fire Risk : Specific attention will be given to ensure the drilling operations do not present a fire hazard. Any observed difficulties will be reported to TerraConsult.

Reinstatement : The borehole area and borehole itself will be left in a tidy and workmanlike condition such that no hazard remains to the general public.

Contamination: Contamination may be present in natural soils, rock and groundwater as well as made ground. The first 1m of natural materials will be treated as contaminated and then unless identified as

contaminated in the site specific risk assessment other materials will be treated as uncontaminated. See TerraConsult Method Statement TC-SI- 3042 (Contaminated Land)

Contaminated Land : Operatives will be informed of any known areas of contaminated land and the precautions they are required to take. Where unidentified contaminated or suspected contaminated land is encountered work will cease and TerraConsult informed. Any noxious smells or gases will be likewise reported. Crews should always beware of the potential for contaminated ground and maintain a high level of personal hygiene and vigilance

Artesian water: This will be controlled by extending drill casing until a static confining pressure is established.

Unforeseen Circumstances : Rig operatives are responsible for their own health and safety as well as that of others who may be affected by their actions. Any difficulties should be immediately reported to TerraConsult.

Accidents : Minor accidents will be treated with first aid, accidents of a more serious nature will be referred to the nearest casualty hospital. All accidents will be reported and entered into the Company's Accident Book.

Associated Method Statements: For this site reference should also be made to the site entry/access, working on contaminated land, disposal of arisings and decontamination method statements and the drilling and PPE working procedures.

Hazards	Precautions
General changes to the equipment	Operations to be undertaken by skilled experienced personnel with relevant BDA/NVQ qualification. Rig and equipment must be "safe" and operational. See procedures as identified by the manufacturer and BDA publication are followed i.e. Ground Investigation Drilling (Edition 4 1995 pages 10-16).
Falling rig/mast.	Be aware of the activities ongoing, wear safety helmet and boots.
Damage to hands/fingers	This is one of the major hazards as the equipment is heavy and must be handled with respect and care. Keep fingers clear, ensure they cannot become caught, trapped or bumped. Be aware of your own safety, lapses in concentrations are a main cause of incidents. Only approach the equipment and hole when necessary to guide the equipment.
Lifting injuries	Adopt good lifting practices. Seek assistance. Follow Procedure TC-SI-3019 (Manual Handling).
Travelling	Ensure all equipment is well secured to rig, the rig is well secured to the towing vehicle (hitch & chains) and trailer board and lights are attached and working or the rig is secured to D-rings on the floor of the van via cargo straps with ratchet tightening.
Visitors	Visitors should not be permitted into the working areas. Discussions should be made well away from the rig when and where it is safe to do so.
Contamination	Follow Procedure TC-SI-3042 and the site rules on contaminated work and ensure the correct PPE is made available and used. Discuss any usual occurrence with the site Environmental chemist. If unsure stop and ask advice. See Site Specific Environmental Protocols.
Sharps	Before picking up any debris from ground level check for the presence of disused needles.

4.0 RESPONSIBILITIES

The Site Supervisor is responsible for:

- inducting the site team on the contents of the Project Plan;
- the setting out of each trial pit at the location required by the Contract documentation;
- the identification and avoidance of services at each borehole location as detailed in TC-SI-3015 (Services-Overhead) and TC-SI-3016 (Services-Buried);

- general site, safety and environmental management;
- check by inspection that the machine operator holds the requisite Skill Card (CPCS) and that his machine has an appropriate test certificate (LOLER);
- issuing instructions to the Logger. These instructions may be varied as the pitting progresses, depending on and / or as a result of conditions encountered during excavation;
- obtaining services drawings and plans;
- checking for underground voids (mine workings, natural voids, cellars etc).

The Foreman is responsible for:

- ensuring that the control measures specified in the Project Plan are implemented and advising the Site Supervisor of any change in conditions which may require those measures to be varied;
- the safe and environmentally sound condition and operation of the sampling equipment;
- the supervision of the sampling team;
- carrying out whatever sampling, testing and installation required in the hole as advised on the Instruction, under the supervision and guidance of the Logger where necessary;
- safely transporting and setting the rig up over the hole location, the safe execution of the sampling, and dismantling on completion;
- reinstatement of the hole site and access routes used;
- ensuring where practicable that the site adjacent to the hole is kept tidy, and that equipment and samples are accurately and properly labelled, stored and maintained as necessary;
- ensuring the safe transportation of samples to a designated storage area at the end of each shift, or on completion of each borehole, as instructed by the Logger;
- produce and submit daily records as detailed in the procedure below.

The Logging Engineer/Geologist is responsible for:

- ensuring that the control measures specified in the Project Plan are implemented and advising the Site Supervisor of any change in conditions which may require those measures to be varied;
- accurately logging the samples recovered from the borehole;
- visiting the rig as required to provide supervision and guidance to the Lead Driller;
- verifying the daily records and where necessary obtaining approval signatures from the Client's Engineer.

5.0 PROCEDURES

Cable percussion boring is carried out as described in BS5930 (Section 24.9) and as detailed below.

5.1 Pre-requisites

Boring will normally be carried out using a cable percussion rig (Dando 150, Dando 175, Dando 2000, Pilcon Wayfarer or similar), and tools such as casings, shells, stubbers, chisels and sinker bars, as permitted by the Site Supervisor. This technique can also be carried out using modular rigs capable of working down to headroom of 2.5 m. The minimum diameter of borings or internal diameter of casing will normally be 150 mm, however, casings of 200, 250 and 300 mm and larger sizes are also used. It is normal for diesel engine powered rigs to be used, however, pneumatic or electric rigs are also available.

Where borings are of such depth that the advancement of a casing may become impracticable, or where hard strata and obstructions are likely to be met, additional strings of casing of sufficient diameter to complete the work will be provided.

5.2 Setting up

The borings will be made at the locations indicated by the Site Supervisor. Prior to any boring each location will be checked for the presence of buried services (TC-SI-3016) and overhead services (TC-SI-3015). Every location will be CAT scanned even where no services appear on service plans. Hand dug inspection pits will be required in **all** locations except where there are specific instructions to the contrary. All services located in

the pits will be accurately noted on the Cable Percussion Boring Journal, referenced to existing permanent points, for example buildings, and reported to the Site Supervisor and in turn the Client's representative as appropriate. The inspection pit should be backfilled prior to commencing boring.

The boring rig and machinery will be set up in a manner that is safe for operating personnel and the general public; this may necessitate the provision of fencing. The vicinity will be checked for any other safety, health and environmental hazards (particularly where identified in the Project Plan). Control measures will be implemented to remove or reduce such hazards.

5.3 Boring

The borings will be numbered precisely as outlined by the Site Supervisor on the Borehole Instruction. The diameter and depth of boring and the diameter and depth of all casings will be noted on the Cable Percussion Boring Journal along with depths at which water is encountered, strata descriptions, depths of changes in strata, depths and types of samples recovered, tests carried out and any other relevant information.

Equipment, arisings and spoil will be placed so as not to present a hazard to the rig operatives, the environment or the general public.

In granular soils above the water table and cohesive soils the minimum amount of water necessary to satisfactorily advance the boring will be added. In granular soils below the water table a positive head of water (i.e. above ground water level) will be maintained during boring and sampling in order to counteract the disturbance caused by the removal of overburden.

Where artesian water is encountered the Lead Driller shall immediately inform the Site Supervisor who will agree a solution with the Project Leader.

In borings where hard strata or obstructions are encountered the Lead Driller will continue boring using chisel or similar approved tool for a minimum approved time (normally 1 hour) in attempt to penetrate the hard strata or obstruction. After 1 hour of chiselling the Lead Driller shall inform the Site Supervisor.

The Site Supervisor, after discussion with the Client's Engineer where necessary, should instruct the Lead Driller to proceed in one or more of the following ways:

- continue chiselling in an attempt to break it up sufficiently for fragments to be recovered and identified, until otherwise instructed;
- abandon the boring, leaving a casing in place so that drilling can be continued by rotary methods;
- withdraw the casing and abandon the boring completely after proper backfilling, and commence boring at a new nearby and agreed position.

In the event of discovering an unexpected condition (e.g. contamination) boring should cease and an instruction sought from the Project Leader.

5.4 Sampling and Testing

Sampling, testing and their frequency will be in accordance with Borehole Instructions issued. The preparation for and methods of taking samples, together with their size, preservation and handling will be in accordance with TC-SI-1090 (geotechnical samples) TC-SI-1091 Piston Samples and TC-SI-2030 (environmental soil samples).

In situ tests and monitoring are carried out in accordance with TC-SI-1000; 1200 and 2000 series procedures.

When an uncompleted hole is left overnight, no soil samples will be taken until the hole has been advanced by a minimum of 300 mm from the overnight depth, unless otherwise instructed.

5.5 Backfilling and Completion

On completion of boring, the borehole will either be backfilled with arisings, grouted up or a monitoring device installed. Details of any installation must be confirmed before backfilling. A precise record of backfilling and/or installation will be made on the Cable Percussion Boring Journal.

If it is not possible to extract the casing then the Site Supervisor will be informed to determine further action. A record of size and depth of any casings left in the ground will be made on the Cable Percussion Boring Journal.

Where artesian conditions are encountered an instruction shall be sought from the Project Leader.

The borehole will be properly reinstated so that no depression is left; a certain amount of mounding may be required to achieve this in the longer term. The surrounding areas will be left reasonably clean and cleared of any debris. Any excess spoil will be removed to the site collection point and removed from site in accordance with the waste management procedure (TC-SI-3013).

5.6 Records

The top three copies of the Cable Percussion Boring Journal will be given or forwarded daily, at the end of each shift, or the following morning at the latest to the Logging Geologist or Site Supervisor who will check the content before countersigning and distributing as necessary.

6.0 REFERENCES

British Drilling Association (BDA): 2000: Guidance for the Safe Operation of Cable Percussion Rigs and Equipment

British Drilling Association: 2008: Guidance for Safe Intrusive Activities on Contaminated or Potentially Contaminated Land. Final Draft, November 2008.

BS 1377: 1990: Methods of test for soils for civil engineering purposes. Published in nine parts. British Standards Institution

BS 5930 2015: Code of Practice for Site Investigations. August 2015. British Standards Institution.

BS 10175: 2011+A1:1013: Investigation of potentially contaminated sites – Code of Practice. British Standards Institution

HMSO: 1974: Health and Safety at Work etc Act 1974.

HMSO: 1999: Management of Health and Safety at Work Regulations 1999.

HMSO: 2015: Construction (Design and Management) Regulations 2015.

TerraConsult

SSOW

Cable percussion rig

Revision level	2
Issue date	2nd May 2013

Date		**Site location**	
Assessor		**Lead driller**	

Rig set up – to be completed by engineer on site

	Ok		Ok
Side stays and pins		'Jump Bar' over crown wheel	
Lower cross bar and pins		Clutch and winch guards	
Wire rope grip installation		Correctly timbered?	
Geometry			

Documentation checks

	Ok		Ok
LOLER (rig, shackles, rope, etc.)		CSCS card / NVQ2	
Daily maintenance check sheet		Insurance	
Underground services training			

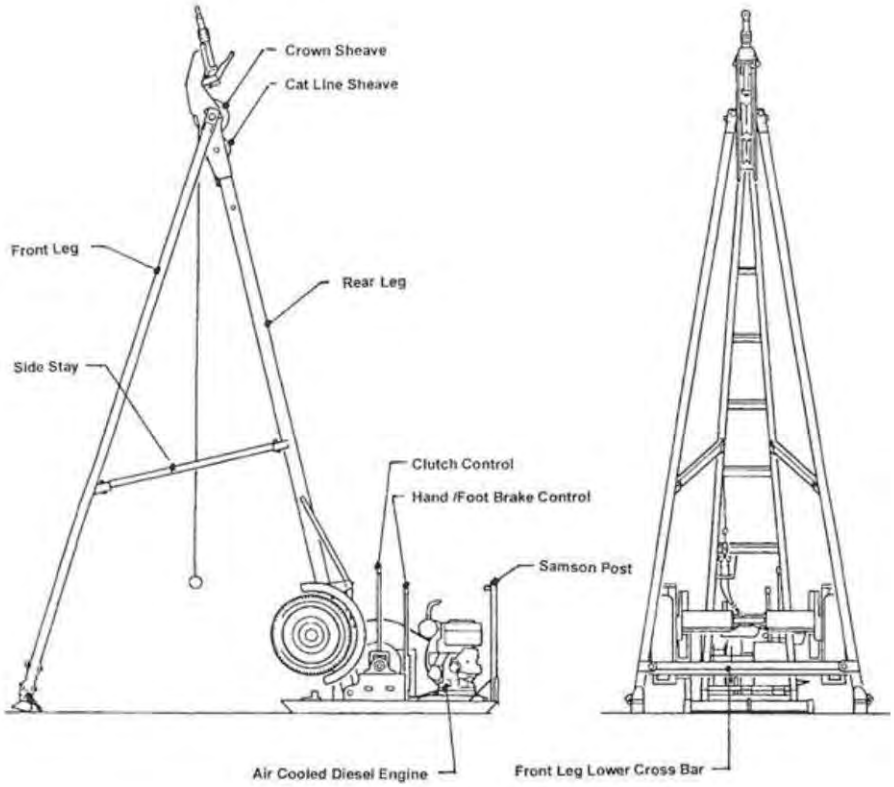
Personal Protective Equipment (lead driller and driller)

	Ok		Ok
Overalls		Ear defenders	
Boots		Hard hat	
Hi vis clothing (as applicable)		Gloves	
LEP			

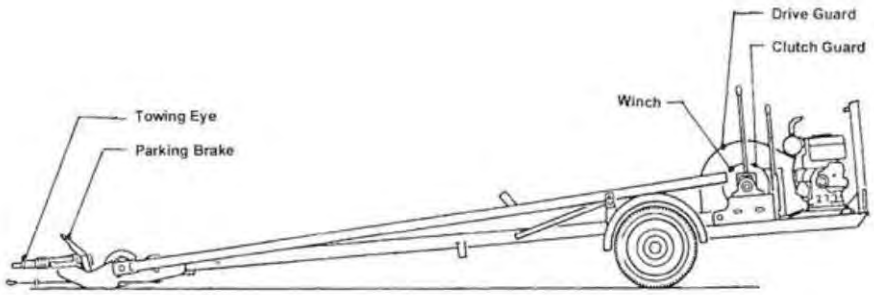
Rig erection

	Ok		Ok
Electric winch?		Rope through A frame	
Assistant driller clear?			

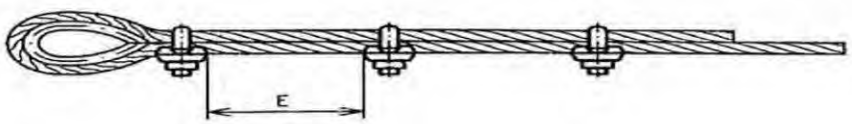
Rig Setup and Checks:



ASSEMBLY OF DRILLING RIG



RIG IN TRAVELLING POSITION.



Risk Assessment RA 3: Excavator

TerraConsult

Project:	RA 3: Excavator iss 3			Project No:	NA
Author:	Tom Phillips CMIOSH	Signature:	TPhillips	Date:	24/11/2015
Checker:	D Daniels	Signature:	DDaniels	Date:	06/01/2016
Approver:	C S Eccles	Signature:	CS Eccles	Date:	08/01/2016

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
1	Failure of lifting equipment	Everyone on site	5	3	15	Excavator to be LOLER assessed correctly (12 months) if used for lifting. This includes any lifting eyes, attachment points and the quick hitch. Lift plan needs to be in place before work starts.	Excavator contractor / site supervisor	5	2	10
2	Incorrect usage resulting in over turning, damage, injury, etc.	Everyone working near excavator	5	4	20	Operator to be in possession of CPCS/CSCS or LANTRA qualification for the plant in use.	Excavator contractor / site supervisor	5	2	10
3	Flying debris whilst breaking hard standing/obstruction	Everyone working near excavator	5	3	15	Excavator windows to be closed and personnel in proximity to work area to wear safety helmet with visor. Other personnel on site to be in a position of safety.	Excavator contractor / site supervisor	5	1	5
4	Noise	Everyone working near excavator	3	4	12	All employees working near the excavator will wear hearing protection which will provide a minimum of 15dB attenuation.	Excavator contractor / site supervisor	3	2	6

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
5	Contact with underground services	Everyone working near rig	5	3	15	Drawings of utilities to be provided for all sites. Services in the area will be located and the area of work will be checked with a CAT before work starts. Operator to be in posession of a formal training certificate for the CAT.	Site supervisor	5	1	5
6	Bucket detachment	People working in the vicinity	5	4	20	TerraConsult engineers trained to be aware of quick hitches and safety features. Excavator drivers to demonstrate safety features of rig before work starts. Safety pins to be fitted where needed.	Excavator contractor / site supervisor	5	1	5
8	Injury from physical hazards	Everyone working near excavator	5	3	15	Working area to be kept clear of non essential personnel. Barriers may be required to prevent access to members of the public etc. All personnel in the working area to wear a hard hat and safety boots with toe and midsole protection.	Contractor / site supervisor	5	2	10

Risk Assessment RA7: Excavations

TerraConsult

Project:	RA7: Excavations - iss 2			Project No:	N/A
Author:	Tom Phillips CMIOSH	Signature:	Tom Phillips	Date:	24/11/2015
Checker:	D Daniels	Signature:	DDaniels	Date:	06/01/2016
Approver:	C S Eccles	Signature:	C S Eccles	Date:	08/01/2016

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
1	Collapse of excavation	Site staff	5	3	15	**No entry to excavations deeper than 0.5m, without a permit to work being completed. Entry will require a competent person to assess (see guidance). Approach all pits from the narrow end and be aware of undercutting.**	Site supervisor	5	1	5
2	Surcharging	Site staff	5	3	15	Never place spoil, plant or loads closer than 1.5m from the edge of any excavation or upslope of the excavation.	Site supervisor	5	2	10
3	Items falling into excavation	Site staff in the excavations	5	2	10	All excavations where person entry will be required, will be 'edge potected' by the trench box sides or shoring. All such support will be designed by a temporary works coordianator.	Site supervisor	5	1	5
4	Plant falling into excavations	Plant operatives and staff in the excavations	5	2	10	Site all plant and equipment at least 1.5m away. Provide dumper blocks, stop blocks or barriers where moving plant is likely.	Site supervisor	5	1	5
5	Ingress of ground and surface water	Site staff in the excavations	5	3	15	Cease work if weather conditions cause surface water to enter or if ground water cannot be controlled.	Site supervisor	4	1	4

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
6	People falling into excavations	MOP, site staff	5	3	15	If excavation is to be left unattended in an area where people may reasonably foreseeably be present, it will be fenced using Heras fencing. If it unlikely that there will be people in the area, it will be surrounded by traffic barriers or flutter tape.	Site supervisor	5	1	5

1.0 SCOPE

To define the procedure by which trial pits and trenches are excavated in open ground **without man entry** below a depth of 1.20 m and sampled in a safe manner. This procedure applies to trial pits up to a depth of 5.0 metres which are excavated and backfilled in the same day. This procedure shall be followed in conjunction with other relevant TerraConsult procedures particularly taking into account TC-SI-3025 Excavations.

2.0 DEFINITIONS

Trial pits and trenches are non man entry excavations when in excess of 1.2m below ground level.

The Site Supervisor is the TerraConsult representative in control of the site and has responsibility for all safety, environmental, technical and contractual aspects of the site works.

The Logger shall be an experienced person who has under gone appropriate training in safety and technical training. The Logger and Site Supervisor may in some circumstances be the same person.

3.0 SAFETY

The TerraConsult Limited Policy Statements and Health & Safety Manual and contract specific Project Plan is produced for each contract undertaken and defines the management structure and the risks associated with the operations in which it is engaged. The document which is retained on site at all times and confirms that health, safety and the protection of the environment are **management responsibilities.**

The document, which was originally written to comply with obligations imposed by Section 3(3) of the Health and Safety at Work Act 1974, have been revised to incorporate the requirements of new legislation, notably the Construction (Design and Management) Regulations 2015 (C.D.M).

Equipment : All excavators shall have a current plant (LOLER) certificate and to comply with manufacturers' specification. Plant will be maintained in good working order.

Operator : The driver of the excavator shall hold a current requisite Skill Card (CPCS)

Personal Protective Equipment : Hard hats, steel toe caps, Hi-Hi jacket and protective gloves will be worn at all times when in the vicinity of the excavator during working operations.

Working Areas : Working areas shall be checked for potential hazards prior to commencement including evidence of service trenches, invasive plants and "trip" hazards.

Underground Services : Unless cleared by TerraConsult all trial pits must be carried out in areas where there is a very low risk of encountering services. Any uncertainty will be reported to TerraConsult before continuing – See TerraConsult Method Statement TC-SI- 3016 (Services Buried).

Protection of Others : Protection will be given where there is a risk of injury to the general public, other staff involved with the works or livestock. Protection will be appropriate to the conditions and in compliance with the Specification. Barriers, screening or fencing appropriate to the location will be erected.

Pollution/Environment : All reasonable efforts will be made to protect the environment and avoid pollution of the air, land and water courses. Spillage of soil slurry or water will be contained or diverted in such a manner as not to cause a hazard to the general public or water courses. Any potentially contaminated spoil will be bagged and left separate for controlled off-site disposal. Drip trays or other methods of controlling fuel or oil spillage from plant will be employed.

Nuisance : Nuisance to others will be minimised within the constraints of the project requirements.

Fire Risk : Specific attention will be given to ensure the pitting operations do not present a fire hazard. Any observed difficulties will be reported to TerraConsult.

Reinstatement : The pitting area will be left in a tidy and workmanlike condition such that no hazard remains to the general public.

Contamination: Contamination may be present in natural soils, rock and groundwater as well as made ground. The first 1m of natural materials will be treated as contaminated and then unless identified as contaminated in the site specific risk assessment other materials will be treated as uncontaminated. See TerraConsult Method Statement TC-SI- 3042 (Contaminated Land)

Contaminated Land : Operatives will be informed of any known areas of contaminated land and the precautions they are required to take. Where unidentified contaminated or suspected contaminated land is encountered work will cease and TerraConsult informed. Any noxious smells or gases will be likewise reported. Crews should always beware of the potential for contaminated ground and maintain a high level of personal hygiene and vigilance

Unforeseen Circumstances: Excavator operatives are responsible for their own health and safety as well as that of others who may be affected by their actions. Any difficulties should be immediately reported to TerraConsult.

Accidents : Minor accidents will be treated with first aid, accidents of a more serious nature will be referred to the nearest casualty hospital. All accidents will be reported and entered into the Company's Accident Book.

Associated Method Statements: Reference should also be made to the site entry/access, working on contaminated land, disposal of arisings, decontamination and PPE working procedures.

Hazard	Precautions
Pit Collapse	Stack material away from the excavation. Supervise excavation from end of pit. No persons to enter a pit deeper than 1.2m, even then only when safe to do so.
Falling into excavation	Keep away from edges, backfill as soon as finished.
Falling materials	Wear safety helmet, boots, keep away from excavator, stack materials away from pit edge.
Lifting injuries	Adopt good lifting practices. Seek assistance. Do not overfill bulk bags. Follow Procedure TC-SI-3019 (Manual Handling).
Injury by excavator	Wear safety helmet, boots, stand where the driver can see you. Keep away from bucket swing.
Visitors	Visitors should not be permitted into the working areas. Discussions should be made well away from the excavator when and where it is safe to do so.
Sampling.	Be aware of contamination and sharp objects particularly disused needles, metal and glass.
Contamination	Follow procedure TC-SI-3042 and the site rules on contaminated work and ensure the correct PPE is made available and used. Discuss any usual occurrence with the Project Manager/Director. If unsure stop and ask advice. Be aware of the potential for contamination and report any unusual materials. Ensure any obvious contaminated materials are placed back in the pit and not left at the surface. Be aware of the presence of disused needles on site. See Site Specific Environmental Protocols.
Sharps	Before picking up any debris from ground level check for the presence of disused needles.

4.0 RESPONSIBILITIES

The Site Supervisor is responsible for:

- inducting the site team on the contents of the Project Plan;
- the setting out of each trial pit at the location required by the Contract documentation;
- the identification and avoidance of services at each trial pit location as detailed in TC-SI-3015 (Services-Overhead) and TC-SI-3016 (Services-Buried);
- general site, safety and environmental management;
- check by inspection that the machine operator holds the requisite Skill Card (CPCS) and that his machine has an appropriate test certificate (LOLER);
- issuing instructions to the Logger. These instructions may be varied as the pitting progresses, depending on and / or as a result of conditions encountered during excavation;
- obtaining services drawings and plans;
- checking for underground voids (mine workings, natural voids, cellars etc).

The Logger shall be responsible for:

- ensuring that the control measures specified in the Project Plan are implemented and advising the Site Supervisor of any change in conditions which may require those measures to be varied;
- the identification and avoidance of buried services at each trial pit location as detailed in TC-SI-3015and TC-SI-3016;
- the supervision of the machine operator;
- carrying out whatever sampling and testing is required and for providing a geotechnical description of the pit using the appropriate forms;
- ensuring samples are accurately and properly labelled and stored as necessary;
- photographing of the trial pit;
- the safe construction of trial pits ensuring that the adjacent property or ground is not affected by the digging of the pits;
- the pitting site is kept tidy and spoil is properly placed;
- the backfilling of the pits in a safe manner such that the backfilled pit does not present a hazard and reinstatement of the site and access routes used.

The machine operator shall ensure:

- the safe and environmentally sound condition and operation of the equipment;
- the execution of the their works in a safe and efficient manner;
- safely moving between trial pit locations and the safe excavation of the trial pits.

5.0 PROCEDURES

Pre-requisites

Prior to commencing any trial pitting operation, consideration shall be given to re-instatement requirements. In many cases where a high level of reinstatement is required (e.g. lawns, hard standing etc) other investigation techniques may be more appropriate.

The Site Supervisor shall issue on-site instructions as pitting proceeds based on the Client's Engineer's instruction. The pits shall be dug at the locations indicated by the contract documentation and in agreement between the Site Supervisor or Logger and the Client's Representative on site. The pits shall be numbered precisely as outlined by the Site Supervisor.

Where the pits are dug with a mechanical excavator the operator shall possess a relevant Skill Card (CPCS). The Logger shall be in attendance throughout the work. It is essential that an initial briefing occurs between the Logger and the machine operator to agree a signalling system and method of working. The machinery will be set up in a manner that is safe for operating personnel and the general public; this may necessitate the

provision of fencing or demarcation of the working area. The vicinity will be checked for any other safety, health and environmental hazards (particularly where identified in the Project Plan).

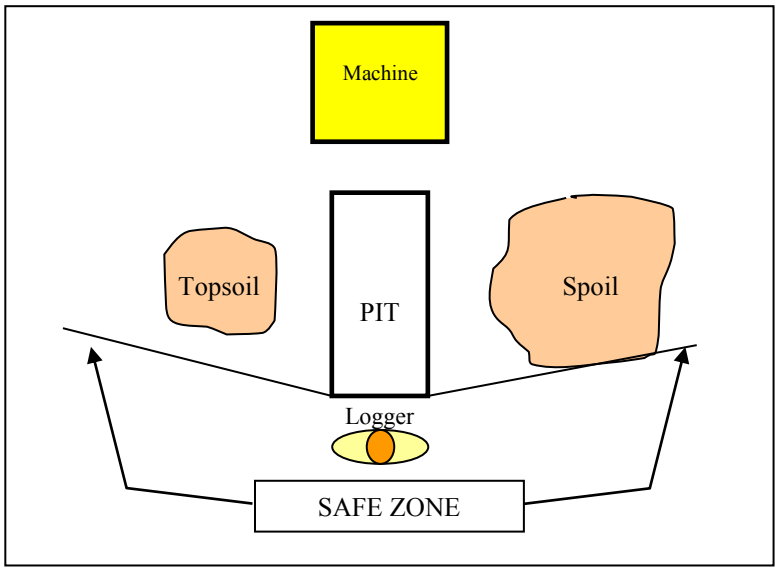
The area in which the pits are to be excavated must be checked for access and services in accordance with TC-SI-3023 (Site Walkover), TC-SI-3015 and TC-SI-3016.

Where trial pits are to be carried out adjacent to structures (e.g. foundations) or other sensitive features discussion with approval shall be given by a Director or Technical Director of TerraConsult.

Excavation

Equipment, arisings and spoil shall be placed so as not to present a hazard to the operatives or the general public. All spoil shall be heaped at least 1 m from the edge of the pit; greater distances maybe required for deeper pits. The surface material, be it topsoil, turf, ballast, tarmac or concrete shall be heaped in separate piles to avoid mixing where possible. The spoil should be placed so as not to cause contamination of any water courses.

Fig 1. Safe arrangement of equipment, spoil materials and Logger.



Prior to proposing to leave a trial pit open and fenced permission should be given by a Director or Technical Director of TerraConsult who will confirm the fencing and security requirements.

Trial pits shall be excavated and backfilled in one shift wherever possible. In the event that a pit has not been completed by the end of a shift or is left unattended, it shall be securely fenced. The area shall be left safe and tidy to the satisfaction of the Logger. Consideration shall also be given to signage and lighting.

Whilst excavation proceeds the stability of the excavation walls shall be assessed by the Logger. If there is any doubt over the stability of the walls, such that instability shall cause surface settlement which might jeopardise the safety of personnel, equipment or property, the excavation shall be terminated and pit backfilled.

NO PERSON SHALL ENTER ANY PIT GREATER THAN 1.20M DEPTH UNDER ANY CIRCUMSTANCES.

The logger shall:

- only approach the pit from the short ends when the JCB arm is at rest and the driver is aware of your approach;
- approach the edge of the excavation with caution and check its stability;
- not lean over the edge of the excavation;
- not stay at the edge any longer than necessary;
- not use the bucket as a working platform.

Records, Sampling and Testing

The following details shall be recorded by the logger:

- strata and features encountered;
- samples taken;
- in situ test locations and results;
- pit stability;
- dimensions and depths, including sketch(es) as appropriate;
- sketch plan showing pit orientation and surrounding features as appropriate;
- groundwater depth, flow rate, contamination, odour etc.
- other observations (e.g. method of excavation, manufacturer and model of excavator, groundwater, ease of excavation, weather, etc);
- Backfill and reinstatement.

Particular attention should be given to groundwater. Water inflow should be recorded either as a seepage or as an entry.

- Seepage is where the quantity of water is insufficient to sample;
- Entry is a larger inflow of water where it will be possible to measure water level after a certain time and sample the liquid. The water level change over a period of time should be recorded;
- Whether water entry is from a course soil overlying a lower permeability fine soil;
- Any instability associated with water entry.

All sampling and testing in the excavation shall be carried out in accordance with procedures TC-SI-1090 (Sampling for Geotechnical Purpose), TC-SI-2030 (environmental soil samples), TC-SI-1110 (Hand Vane) and TC-SI-1220 or TC-SI-1221 (Soakaway Tests).

A minimum of three photographs shall be taken of the excavation; two of the pit faces and a third of the spoil. In general, they must have the contract and trial pit references, a suitable scale on them (e.g. leveling staff or ranging pole) and colour chart. A record indicating which faces were photographed should be made on the Logger's site records.

Completion

On completion, the pit will either be backfilled with arisings or reinstated with imported material as appropriate. Where possible all materials shall be replaced in the pit in the same order that they were excavated. Backfilling shall be carried out in layers, each layer being tamped by the bucket of the excavator.

The pit shall be properly reinstated so that no depression is left; a certain amount of mounding may be required to achieve this in the longer term. The surrounding areas shall be left reasonably clean and cleared of any debris. Any excess spoil shall be removed to the site collection point.

6.0 REFERENCES

BS 1377 : 1990 : Methods of test for soils for civil engineering purposes. Published in nine parts. British Standards Institution.

BS 5930 1999+A2 2010: Code of Practice for Site Investigations. Amendment No 2, August 2010. British Standards Institution.

BS 10175 : 2011+A1 2013: Investigation of potentially contaminated sites – Code of Practice. British Standards Institution

HMSO: 1974: Health and Safety at Work etc Act 1974.

HMSO: 1999: Management of Health and Safety at Work Regulations 1999.

HMSO: 2015: Construction (Design and Management) Regulations 2015.

1.0 SCOPE

To define the procedure for carrying out, analysing and reporting soakaway tests carried out in trial pits. This procedure does not cover other types of infiltration tests carried out in boreholes or sumps.

2.0 DEFINITIONS

Soakaways are used to dispose of surface water from buildings and areas of hard standing. In the UK the design methodology for soakaways is described in BRE Digest 365 (2007) and this document provides a methodology for soakaway tests. The design requires information regarding the rate at which water can soak into the ground – this is defined by the parameter referred to as the soil infiltration rate. The digest includes details for carrying out and interpreting in situ soakage tests used to assess the soil infiltration rate (note that this relates to the movement of water through unsaturated ground and is not the same as the flow of water through saturated ground which is controlled by its permeability. Soakaways are therefore only appropriate for ground above the standing groundwater level.)

Soakaway tests in trial pits are carried out in general accordance with the method described in the BRE digest. Limitations on strictly following the method, for example, in terms of duration of monitoring, should be made clear in the contract documents.

Soakaways can also be used for the disposal of treated effluent. The design of these and the field tests for determining the required parameters are different from those described in BRE Digest 365 and are not covered in this procedure.

3.0 SAFETY

The TerraConsult Limited Policy Statements and Health & Safety Manual and contract specific Project Plan is produced for each contract undertaken and defines the management structure and the risks associated with the operations in which it is engaged. The document which is retained on site at all times and confirms that health, safety and the protection of the environment are **management responsibilities.**

The document, which was originally written to comply with obligations imposed by Section 3(3) of the Health and Safety at Work Act 1974, have been revised to incorporate the requirements of new legislation, notably the Construction (Design and Management) Regulations 2015 (C.D.M).

Personal Protective Equipment (PPE) must be worn when undertaking all works, details of PPE to be worn can be found in TC-SI-3030. As the test requires excavation there is the possibility services maybe present guidance as stated in TC-SI-3016 (Services – Buried) should be followed before any digging of the trial pit commences. As water is required to fill the trial pit special care must be taken working around open water (see TC-SI-3011 – Working over Water).

Where the soakage test is carried out in moderate or poor ground for soakaways, then the test may take more than one day. If this is required then the Project Manager shall ensure that the test location is securely covered and securely fenced off. This methodology should be agreed with a TerraConsult Director. For tests of more than one day duration, consideration can also be given to filling the test location with granular material (see Section 5 below).

4.0 RESPONSIBILITIES

The Project Leader shall ensure that only staff with suitable experience and safety training shall undertake trial pitting and soakaway testing on site.

The appropriate procedures for carrying out trial pitting operations (see TC-SI-1010 – Trial Pitting) should be adhered to before conducting the soakaway test; staff will be responsible for the following post excavation:

- the Site Supervisor shall be responsible for issuing test instructions;
- the Field Engineer/Technician will be responsible for carrying out the test and recording the results.

5.0 PROCEDURES

5.1 Preparation of Test Pit

Trial pits will be excavated at locations selected by the Client/Engineer. The positions and depths should reflect those likely to be used for the actual soakaways.

The trial pits will normally be excavated by a JCB or similar back-acter type machine. Care should be taken to excavate the pits with near vertical sides so as to maintain consistent width and length of pit with depth (this is required to satisfy the assumptions made in the test analysis about volume of flow during the test).

Where the pit is constructed in ground of poor stability, the pit may be filled with granular material and a standpipe installed for monitoring. A sample of the granular material should be retained for assessment of the porosity, which is used in the analysis. Where the pit is filled with granular material a length of perforated well screen should be inserted in on side of the trial pit and this is used so that the level of water in the granular material can be measured during the test.

Monitoring of the water level is normally carried out manually using a conventional dipmeter. Where tests are anticipated to be of relatively long duration a data logger can be used (see TC-SI-2040).

A geotechnical log and description of the trial pit will be prepared in accordance with the relevant TC-SI-1010 Trial Pitting and TC-SI-1070 Soil Description.

5.2 Test Procedure

The trial pit should be filled with water as quickly as possible and the level monitored with time as it soaks away. The depth of water used to fill the pit will be dependant on the ground conditions but as a general rule the top level of the water in the pit should be about 1.0m below the proposed ground level for the development. This is the typical inlet level of drainage pipes for soakaways. Where a site has a reasonable fall to the location of the proposed soakaway, the invert level may be much shallower but would generally be at a depth of not less than 0.50m below ground level. The top level of the water in the pit during the test is taken as the 100% effective depth level.

The frequency of water level readings will depend on the rate of change of water level. A minimum of 10 evenly spread data points should be obtained to allow analysis. If it is not possible to fill the pit the BRE digest allows tests to be carried out in partially filled pits. However, it notes that the calculated soil infiltration rates may be lower than for completely filled pits.

Monitoring of the water level in the pit should continue until the pit is nearly empty. The digest requires that the water level should fall to below the 25% effective depth level to allow the test to be analysed. Normally tests would not run beyond the working day, unless special arrangements have been made for 24 hour monitoring and overnight security of open pits, etc. If the water level has not reached the 25% effective depth then it will not be possible to calculate the soil infiltration rate.

The test should be repeated in the trial pit in the same manner a further two times on the same or consecutive days.

5.3 Data processing and reporting

The data obtained from soakaway tests can be analysed using an in-house spreadsheet . The analysis is in accordance with BRE Digest 365. The following points should be noted:

- where tests do not reach the required 25% effective depth, the soil infiltration rate cannot be calculated and the result sheet will report this fact;
- where trial pits encounter groundwater, this level will be taken as the 0% effective depth;

- where ground conditions indicate significant variations in the material type with respect to the likely infiltration characteristics (e.g. pit through sand penetrating clay), the dimensions of the pit used for analysis may be altered to reflect this.

6.0 REFERENCES

BRE: 2007: Soakaway design. Publication 365

BS 5930: 2015: Code of practice for site investigation. British Standards Institution.

HMSO: 1999: Management of Health and Safety at Work Regulations 1999. As Amended.

HMSO: 1974: Health and Safety at Work etc Act 1974.

HMSO: 2015: Construction (Design and Management) Regulations 2015.

TerraConsult

SSOW

Excavator

Revision level	2
Issue date	2nd May 2013

Date		**Site location**	
Assessor		**Driver**	

Excavator set up – to be completed by engineer on site

	Ok		**Ok**
Quick hitch used?		CPCS / CSCS card	
Safety pins fitted?			
State type of hitch used: Operator demonstrates hitch safety features? Note essentials.			

Documentation checks

	Ok		**Ok**
LOLER (hitch and lifting points)		Insurance	

Personal Protective Equipment (those working in the vicinity)

	Ok		**Ok**
Overalls		Ear defenders	
Boots		Hard hat	
Hi vis clothing (as applicable)		Gloves	
LEP			

Risk Assessment RA3: Plate Bearing Test

TerraConsult

Project:	RA6: Plate Bearing Test - iss 3			Project No:	N/A
Author:	Tom Phillips CMIOSH	Signature:	Tom Phillips	Date:	24/11/2015
Checker:	D Daniels	Signature:	DDaniels	Date:	06/01/2016
Approver:	C S Eccles	Signature:	C S Eccles	Date:	08/01/2016

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
1	Damage to overhead services or buried services	Site staff	5	4	20	Drawings of utilities to be provided for all sites. Services in the area will be located and the area of work will be checked with a CAT before work starts. Operator to be in posession of a formal training certificate for the CAT. Move work location to minimise risk of encountering known buried and overhead services by ensuring correct clearance. See permit to dig. Refer to RA for overhead lines.	Site supervisor	5	2	10
2	Movement of kentledge plant	Site staff	5	3	15	Ensure plant being used for kentledge is under the control of a banksman and immobilised.	Site supervisor	5	1	5
3	Noise	Everyone working near running plant	3	4	12	All employees working near the plant will wear hearing protection while it is running, which will provide a minimum of 15dB attentuation.	Site supervisor	3	2	6
4	Site access/egress and general movements by vehicles (i.e. third party vehicles). i.e. impact.	Site staff and 3rd party site personnel, pedestrians	4	3	12	Where reversing plant is required a banksman shall oversee plant movements. All staff to wear Hi-Vis clothing. Ensure routes are kept clear at all times to allow emergency access. Adhere to site speed limits and signage.	Site supervisor	4	1	4

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
5	Manual handling of plates from vehicle to ground and then to position. Returning back to rear of vehicle. Plates low down and can weigh up to 50Kg. Can be an uneven surface.	Site staff	3	3	9	Manual handling of 600mm plates are two person lifts. Site to be assessed by the individual for each load and ensure surface is level before work starts. Use plant where possible to move plates on site. Plate handles to be moved to the tops of the plates to make it simpler to lift.	Site supervisor	3	2	6
6	Slips, trips and falls	All staff	2	2	4	Safety boots with ankle support (i.e. lace up boots) to be worn in preference to rigger / wellington boots to provide more support and reduce snagging. Assess grounds conditions and working areas - use of boards, ground guards, etc. as required.	Site supervisor	2	1	2
7	Moving site plant/vehicles in vicinity of test locations general movements by vehicles (e.g. third party vehicles). i.e. impact.	Testing technician, site staff and 3rd party site personnel, pedestrians	5	4	20	Where reversing plant is required in area of testing a banksman shall oversee plant movements and the testing. Ensure signage/fencing/bariers around test areas if there is moving traffic. All staff to wear Hi-Vis jackets as a minimum. Ensure routes are kept clear at all times to allow emergency access. Ensure plant adheres to site speed limits and signage.	Site supervisor	5	1	5

METHOD STATEMENTS
PLATE BEARING TEST

1 SCOPE

To define the processes involved in undertaking plate load tests.

2 DEFINITIONS

Plate load tests (PLT) are used to determine the vertical deformation and strength characteristics of soil in situ by assessing the force and amount of penetration with time when a rigid plate is made to penetrate the soil. Uses are to evaluate the ultimate bearing capacity, the shear strength and deformation parameters of the soil beneath the plate without entailing the effects of sample disturbance.

3 SAFETY

The TerraConsult Limited Policy Statements and Health & Safety Manual and contract specific Project Plan is produced for each contract undertaken and defines the management structure and the risks associated with the operations in which it is engaged. The document which is retained on site at all times and confirms that health, safety and the protection of the environment are **management responsibilities.**

The document, which was originally written to comply with obligations imposed by Section 3(3) of the Health and Safety at Work Act 1974, have been revised to incorporate the requirements of new legislation, notably the Construction (Design and Management) Regulations 2015 (C.D.M).

4 RESPONSIBILITIES

The engineer or technician undertaking the test is responsible for ensuring that:

- all necessary equipment is brought to site in good working order;
- that testing is carried out to the appropriate specification;
- that results are passed to the Project Manager or Site Supervisor as appropriate.

5 PROCEDURES

Testing should be undertaken as per the procedures given in BS 1377: 1990 (précis below).

Test locations and depths should be provided by the Contract Specification or the Designer/Client on site. Where tests are to be undertaken below 1.20m below ground level or in ground that is deemed to be prone to failure, the excavation should be battered back or shored prior to entry. Tests should not be undertaken below the water table or where water is entering the trial pit.

Test locations should be checked for services and a permit to work issued prior to the test being undertaken. It should be noted that buried pipes are susceptible to damage from the loads applied during plate load tests.

Test results should be presented as per BS 1377: 1990.

6 PROCEDURES

- Determine appropriate kentledge (reaction mass) for test;
- a circular plate (diameter to be specified by client) shall be used;
- make sure that the area for the plate is generally level and is undisturbed as possible;
- the plate shall be placed on a thin layer (10-15mm thick) of clean dry sand to produce a level surface on which to bed the plate;
- ensure the plate is level by use of a spirit level;
- place the jack in the centre of the plate underneath the reaction load, making sure that this is done on a solid part of the machine being used;
- place the beam along side the plate and position the dial gauge evenly across the plate;

- pump the jack up to biting point, during this operation a small seating load may be applied to the plate to enable adjustments to be made: this seating load shall be less than 5kn/m^2;
- take zero mm penetration readings off the dial gauges;
- the load shall be applied in even increments and written on the work sheet provided in bar;
    - *if the ground being tested appears to be soft use small increments e.g. in 10 or 20 bar;*
    - *if the ground being tested appears to be firm increments of 40 to 50 bar can be used.*
- at each increment the pressure shall be maintained as near as possible constant;
- after each increment and when satisfied that there is no further movement from the dial gauge, readings can be taken from the dial gauges;

7 REFERENCES

BS 1377: 1990: Part 9

TerraConsult

SSOW

Plate Bearing Test

Revision level	2
Issue date	2nd April 2015

Date		**Site location**	
Assessor		**Engineer/Technician**	

To be completed before work starts

Kentledge set up

(complete next section only if excavator is used).

	Ok		**Ok**
Quick hitch used?			
Safety pins fitted?			
State type of hitch used: Operator demonstrates hitch safety features? Note essentials.			

For all plant:

	Ok		**Ok**
Means of immobilising plant established for duration of test?		If tests are to be undertaken within excavation has a suitable batter or means of shoring been implemented?	
Comments:			

Documentation checks

	Ok		Ok
LOLER (hitch and lifting points)		Insurance	
CPCS / CSCS for plant used			
Comments:			

Personal Protective Equipment

	Ok		Ok
Overalls		Ear defenders (as applicable)	
Boots		Hard hat	
Hi vis clothing (as applicable)		Gloves	
LEP (as applicable)			
Comments:			

Manual Handling

- 450mm and 600mm plates are a two-person lift.
- Use site plant to move plates across site.

Risk Assessment RA8: Underground Services

TerraConsult

Project:	RA8: Underground Services - iss 2			Project No:	N/A
Author:	Tom Phillips CMIOSH	Signature:	Tom Phillips	Date:	24/11/2015
Checker:	D Daniels	Signature:	DDaniels	Date:	06/01/2016
Approver:	C S Eccles	Signature:	C S Eccles	Date:	08/01/2016

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
1	Electric cables	Site staff	5	4	20	Permit to dig for all sites, to be signed before work starts. Statutory utility drawings to be obtained for all sites. Person signing the permit to dig, to be trained in the use of CAT and Genny and HSG47. All services to be located and marked on the ground before work starts. All mechanical work to be done in accordance with agreed clearances (see permit to dig). Anyone working in the ground, inside the clearance distances, to be trained in CAT and Genny and HSG47 and to wear flame retardent overalls and use insulated digging tools.	Site supervisor	5	1	5

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
2	Gas mains	Site staff	5	4	20	Permit to dig for all sites, to be signed before work starts. Statutory utility drawings to be obtained for all sites. Person signing the permit to dig, to be trained in the use of CAT and Genny and HSG47. All services to be located and marked on the ground before work starts. All mechnical work to be done in accordance with agreed clerances (see permit to dig). Anyone working in the ground, inside the clearance distances, to be trained in CAT and Genny and HSG47 and to wear fire retardent overalls and use insulated digging tools.	Site supervisor	5	1	5
3	Pipelines	Site staff	5	4	20	Linesearch check on all sites. If highlighted, seek guidance from owners.	Site supervisor	5	1	5
4	Water mains	Site staff	4	4	16	Permit to dig for all sites, to be signed before work starts. Statutory utility drawings to be obtained for all sites. Person signing the permit to dig, to be trained in the use of CAT and Genny and HSG47. All services to be located and marked on the ground before work starts. All mechnical work to be done in accordance with agreed clerances (see permit to dig). Anyone working in the ground, inside the clearance distances, to be trained in CAT and Genny and HSG47.	Site supervisor	4	1	4

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
5	Telecoms - incl fibre optics	Site staff	4	4	16	Permit to dig for all sites, to be signed before work starts. Statutory utility drawings to be obtained for all sites. Person signing the permit to dig, to be trained in the use of CAT and Genny and HSG47. All services to be located and marked on the ground before work starts. All mechnical work to be done in accordance with agreed clerances (see permit to dig). Anyone working in the ground, inside the clearance distances, to be trained in CAT and Genny and HSG47.	Site supervisor	5	1	5
6	Sewers, drains, etc.	Site staff	4	4	16	Permit to dig for all sites, to be signed before work starts. Statutory utility drawings to be obtained for all sites. Person signing the permit to dig, to be trained in the use of CAT and Genny and HSG47. All services to be located and marked on the ground before work starts. All mechnical work to be done in accordance with agreed clerances (see permit to dig). Anyone working in the ground, inside the clearance distances, to be trained in CAT and Genny and HSG47.	Site supervisor	5	1	5
7	Site specific hazards such as TFL, steam lines, process lines, etc.	Site staff			0	Procure relevant site drawings. Location devices may include geophysical methods. Assess each site on a site specific basis.	Site supervisor			0

1.0 SCOPE

To define procedures to be implemented in respect of all ground investigation/earthmoving works carried out by TerraConsult Limited (TCL) or its subcontractors in relation to the avoidance of underground services.

2.0 DEFINITIONS

For the purpose of this Method Statement, the term service(s) means all underground pipes, cables and equipment associated with the electricity, gas, water (including piped sewage) and telecommunications infrastructure. Also, other pipelines which transport petrochemical and other fluids. Underground structures such as railway structures etc are not included.

3.0 SAFETY

The TerraConsult Limited Policy Statements and Health & Safety Manual and contract specific Project Plan is produced for each contract undertaken and defines the management structure and the risks associated with the operations in which it is engaged. The document which is retained on site at all times and confirms that health, safety and the protection of the environment are **management responsibilities.**

The document, which was originally written to comply with obligations imposed by Section 3(3) of the Health and Safety at Work Act 1974, have been revised to incorporate the requirements of new legislation, notably the Construction (Design and Management) Regulations 2015 (C.D.M).

This Method Statement in its entirety relates to the preservation of the health and safety of personnel and the general public as the avoidance of underground services is one of the key areas where thorough consideration and provision of preventative measures is most important in terms of safety.

Personnel involved in the detection of underground services and the planning of exploratory hole locations should be familiar with the HSE publication entitled “Avoiding Danger from Underground Services” (HSG47, 2014).

A site specific health and safety risk assessment must be completed before commencement of and excavations or exploratory holes and a permit to dig issued.

4.0 RESPONSIBILITIES

It is the responsibility of the Project Manager to ensure that all information relating to the location of services is obtained. It must be ensured that intrusive works are carried out at a safe distance from any buried service and that every supervisor of ground disturbance work on the site is made aware of the location of buried services.

It is the responsibility of every supervisor undertaking ground disturbance work on a TCL site to adhere to the following rules and follow the principles of the advice issued by HSE when working near underground services (see References below).

All personnel using a Cable Avoidance Tool (CAT) shall have attended and passed a one-day approved externally run training course.

5.0 PROCEDURES

Causing damage to buried services, especially electric cables, is an major risk for personnel. It is also potentially a major area of cost to the Company. Whilst such incidences are covered by our insurance policies, the effectiveness of performance in this area has a great impact on our insurance premiums. In turn, this of course has the potential to affect the competitiveness of TCL. All this is quite apart from the inherent dangers associated with accidentally damaging buried services.

When uncovering services without damage, there still remains the problem of protecting services from subsequent damage during operations. This may be simple damage, similar to that likely in digging or collapse due to lack of support over open excavations, or to lack of protective cover. The proper treatment of exposed services is therefore just as important as avoiding during excavation. It is the site agent's responsibility to provide proper support to the services once revealed.

These standard procedures, which should be followed on all projects, are introduced, therefore, to minimise the risk of danger – to our employees, subcontractors and others, as well as improving the cost effectiveness of our operations.

Warning – there are many private suppliers these days such as AGAS (gas pipelines), EPN Networks (electricity), and Aquila (Electricity). It is therefore important to ask the local authority as well as the national utilities if they are aware of other suppliers in the area.

The Project Manager shall ensure that drawings showing the position of services are obtained and used to plan the safe location of intrusive works. Clients have a duty to provide information on buried services (and other hazards). They cannot opt out of this duty. They can, however, ask the contractor to make enquiries on his behalf. This would be a legitimate charge to the contract.

Note – most utility drawings will not show connections to properties therefore extra investigation may be required.

For certain high risk services (e.g. high voltage cables, high pressure gas mains, oil pipelines, fibre optic cables) there may be a need to adopt special procedures and/or agree method statements for the work in advance with those service providers. Before drilling commences a Cable Avoidance Tool (CAT) scan should be carried out at all locations where intrusive works are proposed. As well as clearing each individual proposed exploratory hole location, any detectable services on the site should be picked up and the path of the service run marked out where appropriate. Note that various other cable and pipe locating devices are available (for example Hum Detectors, Radio Frequency Detectors, Transmitter-receiver Instruments, Metal Detectors, Ground Probing Radar). The CAT is the most commonly used instrument for cable detection and is a radio frequency detector.

Private electricity supply cables might not be shown on drawings. Sometimes cables not carrying a current e.g. street lighting cables, do not register although they are “live”. The use of a Genny in conjunction with the CAT will assist with their detection and should be considered where appropriate. Training in the use and limitations of such equipment is important. Some water and gas mains are now plastic and cannot be located by CAT. Also some telephone cables have high voltage wires within them to power the repeater stations. Therefore extra investigation may be required. Services are normally laid within 1.2m of the surface. However, they may occur at greater depths where the ground has been overfilled. Sewer pipes, culverts and tunnels can occur at any depth.

The full operating procedures of the CAT or other locating device are not covered in detail in this Method Statement, however before its use, the user manual specific to the model used must be read and understood in full. Personnel using the CAT should undergo appropriate training.

A detailed examination of the area around the proposed borehole or trial pit to look for signs of buried services should be made. Most utility companies will have markers or manholes at regular intervals. Where proposed drilling is within 1m of a service, consideration must be given to re-locating the borehole position to reduce risk. Where permission to move the borehole is not granted the exact location of the service must be established by digging an inspection pit, these are typically 1.2m deep. During excavation of the inspection pit care must be taken to ensure that any cables or cable markers, pipes or pipe markers are not disturbed. Should services be found in the pit the supervising Engineer/Geologist or Site Agent must be informed. Probing ahead in the base of the inspection pit is not permitted, this practice is extremely dangerous. On completion of the inspection pit, a further check should be made in the base of the pit with the CAT as services are often stacked one above another. Once clearance is obtained from the supervisor work can proceed with the construction of the exploratory hole.

All services located must be charted and noted in the daily record sheets.

If information from separate drawings is consolidated onto one drawing for ease of reference, a list of all services that the draughtsman has checked must be stated on the drawing to eliminate assumption and confusion.

Electricity Cable Found
Once an electricity cable has been found in the vicinity of a proposed hole all personnel must be informed prior to any disturbance of the ground. If the cable is detected within 1m of any proposed hole an inspection

Hole(s) shall be carefully dug using only hand tools to expose the service and to establish its path and depth. CAT scans shall be carried out as hand digging proceeds. Cables are often laid in clusters, therefore finding one may not mean that all have been found. Inspection holes should be dug to a depth of 1.2m in made up ground. If a cable is damaged of found to be damaged the relevant utility company must be informed.

Gas/Oil Pipeline Found
Permission must be obtained from the relevant supply authority before carrying out any drilling operations or trial pitting within 3m of any medium/high pressure gas or oil pipelines. Such pipelines will be found in canal towpaths and running across farmland and other remote locations. The pipeline owner may require specific precautions to be taken. In all cases due diligence should be applied to avoid the setting up of equipment above such pipelines and protection at cross over points shall be considered where heavy drilling equipment is involved.

Action if Damage Occurs
If a service is damaged, the authority responsible must be informed at once. In the case of water, gas and electricity, there may be immediate danger. The area of a borehole should be sealed off and if the damaged service is in a trial pit the excavation should be evacuated immediately and sealed off. In the case of a gas escape all plant must be switched off. Urgent action to prevent a possible explosion should be taken by warning passers-by not to use matches or smoke and remove from the scene other possible causes of ignition, e.g. loose electrical connections to traffic light batteries, sparks from starter motor or vehicles.

6.0 REFERENCES

BS 5930: 1999+ A2 2010: Code of practice for site investigation. British Standards Institution.

BS 10175: 2011+ A1 2013: Investigation of potentially contaminated sites – Code of Practice. British Standards Institution

HMSO: 1974: Health and Safety at Work etc Act 1974.

HMSO: 1999: Management of Health and Safety at Work Regulations 1999.

HMSO: 2015: Construction (Design and Management) Regulations 2015.

HSE: 2014 : Guidance Note 47 Avoiding Danger from Underground Services. Health and Safety Executive.

Risk Assessment RA9: Above ground services

TerraConsult

Project:	RA9: Overhead services - iss 2			Project No:	N/A
Author:	Tom Phillips CMIOSH	Signature:	Tom Phillips	Date:	24/11/2015
Checker:	D Daniels	Signature:	DDaniels	Date:	06/01/2016
Approver:	C S Eccles	Signature:	C S Eccles	Date:	08/01/2016

No	Hazard	Persons at Risk	Initial Risk Rating			Risk Control Measures	Risk Owner (Implementer of Control Measures)	Residual Risk Rating		
			Severity	Likelihood	Risk			Severity	Likelihood	Risk
1	Overhead cables - electric	Site staff	5	3	15	Obtain electrical transmission and distribution plans for all sites. Visual survey on arrival at site. All work to be carried out a minimum of 15 metres away from overhead lines unless clearance distances have been obtained from the service provider and a safe working procedure agreed.	Site supervisor	5	1	5
2	Other service lines on private sites	Site staff	5	2	10	Discuss services with site owner / operator.	Site supervisor	5	1	5

1.0 SCOPE

To define procedures in respect of working in proximity to overhead power lines on TerraConsult Limited sites.

2.0 DEFINITIONS

The Electricity at Work Regulations 1989 states "No work shall be carried out on any live electricity cable, or so near one as to cause danger, unless it is necessary to work near live conductors and all practicable precautions are taken to ensure safety". The majority of overhead power lines consist of uninsulated cable. Electricity can "arc" several metres especially in damp or humid conditions. One third of overhead cable strikes result in fatal injury. This Method Statement defines TerraConsult's procedures for undertaking work where overhead power cables are a consideration.

3.0 SAFETY

The TerraConsult Limited Policy Statements, Health & Safety Manual and contract specific Project Plan (produced for each contract undertaken) defines the management structure and the risks associated with the operations in which it is engaged. The document, which is retained on site at all times, confirms that health, safety and the protection of the environment are **management responsibilities.**

The document, which was originally written to comply with obligations imposed by Section 3(3) of the Health and Safety at Work Act 1974, have been revised to incorporate the requirements of new legislation, notably the Construction (Design and Management) Regulations 2015 (C.D.M).

This Method Statement in its entirety relates to the preservation of the health and safety of personnel and the general public as the avoidance of overhead services is one of the key areas where thorough consideration and provision of preventative measures is most important in terms of safety on sites where overhead services are present.

All personnel involved in any way with the movement of vehicles/machinery onto and around the site or undertaking work of any kind on a site where overhead services are present should be familiar with the Electricity at Work Regulations (1989) and the HSE publication entitled "Avoidance of Danger from Overhead Electric Lines" (HSG6, 2013).

A site specific health and safety risk assessment must be completed before commencement of the commencement of the programme of works.

4.0 RESPONSIBILITIES

The Project Manager shall ascertain if there are any overhead cables on the site of any proposed drilling or exploration or which could impede the safe passage of equipment on the approach to the site and shall take such action that is necessary to comply with the following procedures.

Site Agents shall enforce the rules stated below and any additional rules contained in the Project Plan/Construction Phase Plan.

Contractors and employers are required by law to cooperate in carrying out the precautions given in HSE Guidance Note 6 (2013).

5.0 PROCEDURES

Every effort shall be made to relocate the intended position of any borehole or trial pit that is either directly beneath an overhead cable or could result in any part of a rig, drill, crane, excavator or associated plant coming within 10m of an overhead cable including plant passing under cables.

If work has to take place such that any part of plant being used is able to come within 10m of a cable, the electricity utility company shall be contacted with a view to either having the supply temporarily switched off or agreeing safe clearances in writing.

There are three broad categories of work which require consideration in relation to sites where overhead power lines are present:

- where there will be no work or passage of plant under the lines;
- where plant will pass under the lines;
- where work will be done beneath the lines.

Where there will be no work or passage of plant under the lines

Where work has to be undertaken within 10m of any live cable, a method statement for the works shall be prepared and implemented. Generally, ground level barriers should be erected parallel to the overhead line to prevent danger from any plant approaching too close to the line. The electricity supplier should be consulted to advise a safe separation distance. This will depend on the voltage of the overhead line, however the absolute minimum distance from these barriers to the line should be 6m.

Additional indication should take the form of a line of coloured plastic flags or bunting mounted at a height of 3 to 6m above ground level immediately over the barrier.

Reference to HSE (2013) Guidance Note GS6 Avoidance of Danger from Overhead Electric Power Lines should be made for further details.

Where plant will pass under the lines

Passage of plant under power lines shall only be permitted at designated crossing points specified and marked as such by the Site Agent. The danger area should be made as small as possible by restricting the width of the passageway to not more than a road width of 10m (recommended in HSE GS6). The passageway should cross the route of the line at right angles.

The passageway should be fenced to define its route and goal posts erected at each end to act as gateways. Their construction should be of rigid, non-conducting material such as timber or plastic pipe and should be distinctively coloured. A site/location specific method statement and risk assessment should be developed for erecting and dismantling such structures. The electricity supplier should be consulted for advice on the height of the cross bar.

Warning notices should be erected giving the cross bar clearance height and instructing drivers to lower their masts/jibs and to keep them below this height. Cross bars and notices should be well lit if working is to continue after dark.

Drill rigs and equipment with masts, booms, etc. shall be lowered completely before attempting to cross. All passage under cables shall be supervised by a responsible appointed person. How crossing points are marked shall be at the discretion of the Site Agent/Project Leader having regard to individual circumstances.

Reference to HSE (2013) Guidance Note GS6 Avoidance of Danger from Overhead Electric Power Lines should be made for further details.

Where work will be done beneath the lines

Working directly beneath overhead power lines should be avoided wherever possible and alternative locations sought. This section deals with working beneath overhead power lines however all possible alternatives must have been considered before going ahead and consultation with the HSE and the electricity supplier should be undertaken.

If work beneath the overhead lines cannot be avoided, the barriers, goal posts and warning notices described above should still be employed.

However they will not prevent danger from upward movements of cranes, excavators or other appliances. Additional precautions are therefore essential.

Some broad general advice is given below, however this should not be considered as a comprehensive list. The HSE must be contacted for more specific advice in every case where working under overhead power lines is required to be carried out.

The electricity supplier and the HSE should be consulted regarding the safe clearance beneath the overhead power lines.

Plant that could be capable of reaching beyond the safe clearance must never be taken under the line.

Cranes and excavators may need to be modified by the addition of suitable physical restraints in order that it cannot reach beyond the safe clearance limit.

A responsible person should be appointed to supervise access and operation of plant.

Reference to HSE (1997) Guidance Note GS6 Avoidance of Danger from Overhead Electric Power Lines should be made for further details.

6.0 REFERENCES

HMSO: 1974: Health and Safety at Work etc. Act 1974.

HMSO: 1989: Electricity at Work Regulations 1989.

HMSO: 1999: Management of Health and Safety at Work Regulations 1999.

HMSO: 2015: Construction (Design and Management) Regulations 2015.

HSE: 2013: Guidance Note GS6 Avoidance of Danger from Overhead Electric Power Lines 1991. Health and Safety Executive.

RECORD OF SITE INDUCTIONS AND SKILL CHECKS

(ON COMPLETION OF FIELDWORK THIS FORM SHOULD BE SCANNED AND SAVED IN THE H&S SECTION OF THE PROJECT FOLDER)

NAME	SIGNATURE	SKILL CARD	COMPANY	DATE	INDUCTOR

Appendix II TerraConsult Programme of Works Ysgol Bro Rhosyr

2963 Ysgol Bro Rhosyr
Programme of works

	MONDAY 22-Aug	TUESDAY 23-Aug	WEDNESDAY 24-Aug	THURSDAY 25-Aug	FRIDAY 26-Aug
DRILLING	BH1	BH2	BH3	BH4	BH5
TRIAL PITTING		*TP1* TP2 TP3 TP4 *TP5*	Excavations complete		
CBR TEST		*CBR1* CBR2 CBR3 CBR4 *CBR5*			
SOAKAWAY	SW1 SW2 SW3 *SW4*	SW1 Repeat SW2 Repeat SW3 Repeat *SW4 Repeat*			

Denotes archaeological watching brief required

Appendix III Reproduction of Gwynedd Archaeological Trust context sheet pro-forma

GWYNEDD ARCHAEOLOGICAL TRUST **CONTEXT RECORD FORM**

SITE CODE	**GRID SQUARE**	**SITE SUB-DIV**	**CONTEXT NUMBER**
CATEGORY/TYPE	**PROVISIONAL DATE/PERIOD/PHASE**		
LENGTH	**BREADTH**	**DIAMETER**	**DEPTH/HEIGHT**
DEPOSIT			**CUT**
1. Compaction			1. Shape in plan
2. Colour			2. Corners
3. Matrix Composition			3. Break of slope top
4. Inclusions			4. Sides
5. Clarity of Interface			5. Break of slope base
6. Other comments			6. Base
7. Methods & conditions			7. Orientation
			8. Truncated (if known)
			9. Other comments
			Draw sketches overleaf

FILLED BY	[ ] [ ] [ ] [ ] [ ] [ ] This [ ] context [ ] [ ] [ ] [ ] [ ] [ ]
FILL OF	**Stratigraphic matrix**

PLANS	**SECTIONS**
Sheet No.	Sheet No.
Drawing No.	Drawing No.
PHOTOGRAPHS - Film No./ Frame No.	
SAMPLE Nos.	**FIND Nos.**

FEATURE No		**GROUP No**	**CONSISTS OF**
INTERPRETATION/DISCUSSION		**SAME AS**	

	CHECKED BY (initials/date)	**INITIALS/DATE**

SKETCH

DESCRIPTION/INTERPRETATION CONTINUED

Appendix IV Reproduction of Gwynedd Archaeological Trust watching brief pro-forma

YMDDIRIEDOLAETH ARCHAEOLEGOL GWYNEDD ARCHAEOLOGICAL TRUST		
DAY RECORD		*Date*
Project name	*Project number*	*Compiler*
Location		
Description		
Times of travelling and on-site		
Drawn record details		
Photographic record details		

YMDDIRIEDOLAETH ARCHAEOLEGOL GWYNEDD ARCHAEOLOGICAL TRUST		
DAY RECORD		*Date*
Project name	*Project number*	*Compiler*
Location		
Description		
Times of travelling and on-site		
Drawn record details		
Photographic record details		

Appendix V Reproduction of Gwynedd Archaeological Trust photographic record pro-forma

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

Digital Photographic Record

Include main context numbers for each shot, drawing numbers for sections and any other relevant numbers for cross referencing.
Delete any unwanted photos **immediately** from the camera. Regularly upload photographs to computer.

Project Name:			Project Number:				
Photo No.	**Trench**	**Description**	**Contexts**	**Scales**	**View From**	**Initials**	**Date**

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

Digital Photographic Record Project code and name:

Include main context numbers for each shot, drawing numbers for sections and any other relevant numbers for cross referencing.
Delete any unwanted photos **immediately** from the camera. Regularly upload photographs to computer.

Project Name:			Project Number:				
Photo No.	**Trench**	**Description**	**Contexts**	**Scales**	**View From**	**Initials**	**Date**

8 APPENDIX II

Gwynedd Archaeological Trust photographic metadata

File reference	Project name	Project phase	Sub-division	Trench	Description	View from	Scale (s)	Type	Date	Originating person	Originating organisation
G2467_207	New Ysgol Bro Aberffraw	watching brief	Field 2	SW4 GI works	SW facing section of SW4	SW	1X1	Digital Photograph	22/08/2016	AMO	GAT
G2467_208	New Ysgol Bro Aberffraw	watching brief	Field 2	SW4 GI works	Length of SW4	NW	2X1	Digital Photograph	22/08/2016	AMO	GAT
G2467_209	New Ysgol Bro Aberffraw	watching brief	Field 2	TP5 GI works	NW facing section of TP5	NW	1X1	Digital Photograph	22/08/2016	AMO	GAT
G2467_210	New Ysgol Bro Aberffraw	watching brief	Field 2	TP5 GI works	Length of TP5	SW	2X1	Digital Photograph	22/08/2016	AMO	GAT
G2467_211	New Ysgol Bro Aberffraw	watching brief	Field 1	TP1 GI works	NW facing section of TP5	NW	1X1	Digital Photograph	22/08/2016	AMO	GAT
G2467_212	New Ysgol Bro Aberffraw	watching brief	Field 1	TP1 GI works	Length of TP1	SW	2X1	Digital Photograph	22/08/2016	AMO	GAT

Gwynedd Archaeological Trust
Ymddiriedolaeth Archaeolegol Gwynedd

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