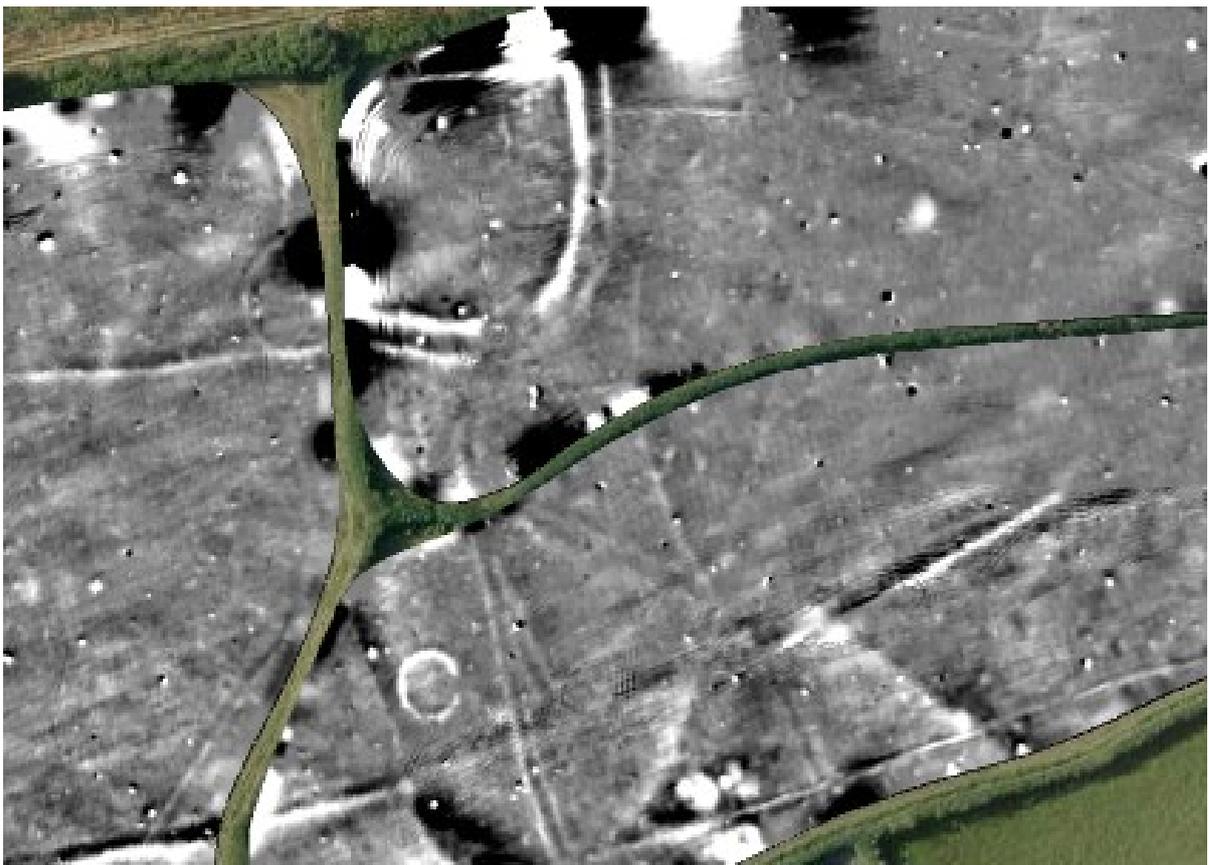




Trethosa, St. Stephen in Brannel, Cornwall

Report on geophysical survey



Historic Environment Projects

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Report on geophysical survey

Client	Trethosa Solar Ltd
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The magnetometer survey was undertaken by Archaeophysica Ltd.

The Project Manager was Dr. Andy Jones.

The views and recommendations expressed in this report are those of Historic Environment Projects and are presented in good faith on the basis of professional judgement and on information currently available.

Freedom of Information Act

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Cover illustration

An extract from the northern section of the geophysical survey of Trethosa, showing the late prehistoric round and the nearby ring-gullies.

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Contents

1	Summary	1
2	Introduction	3
2.1	Project background	3
2.2	Aims	3
2.3	Methods	3
2.3.1	Desk-based assessment and ZTV mapping/analysis	3
2.3.2	Geophysical survey	3
2.3.3	Post-fieldwork	4
3	Location and setting	4
4	Project extent	5
5	Designations	5
5.1	National	5
5.2	Regional/county	5
5.3	Local	5
5.4	Rights of Way	5
6	Summary site history	5
7	Summary results of geophysical survey	6
8	Significance	9
9	Likely impacts of the proposed development	9
9.1	Types and scale of impact	9
9.1.1	Types of impact, construction phase	9
9.1.2	Types of impact, operational phase	10
9.1.3	Impacts on archaeological sites within the development area	10
10	Mitigation Strategy and recommendations	10
10.1	Site redesign	10
10.2	Archaeological evaluation trenching	10
10.3	Archaeological mitigation during the construction phase	11
11	References	11
11.1	Primary sources	11
11.2	Publications	11
11.3	Websites	11
12	Project archive	11

List of Figures

Fig 1. The location of Trethosa Farm.

Fig 2. The extent of the project area at Trethosa Farm.

Fig 3. The project areas as shown on the circa 1840 St Stephen in Brannel Tithe Map.

Fig 4. The project area as shown on the circa 1877 1st Edition OS 25" to the mile mapping.

Fig 5. The project area as shown on a 2005 CCC aerial photograph.

Fig 6. The view north from the A3058 at Halivack towards the site proposed for the solar farm, which consists of the fields to the left of the farm lane to Trethosa (right centre).

Fig 7. Documented removed field boundaries at Trethosa.

Fig 8. The long boundary running through the survey area which is likely to be of medieval or earlier date.

Fig 9. An extract from the 1946 RAF aerial photographic mapping for Trethosa.

Fig 10. An extract from the 1930s OS 25" mapping showing the overhead pipeline in the south western part of the site.

Fig 11. The geophysical survey data for the northern half of the survey area.

Fig 12. The geophysical survey data for the southern part of the project area.

Fig 13. The interpreted survey data for the northern half of the project area.

Fig 14. The interpreted survey data for the southern half of the project area.

Fig 15. Features (in red) interpreted as prehistoric boundaries and structures and (in orange) as possible prehistoric boundaries.

Fig 16. Features (highlighted in grey) as interpreted as belonging to a medieval or early post-medieval field system.

Fig 17. Boundaries (highlighted in grey) shown on the circa 1840 Tithe Map.

Fig 18. Boundaries (highlighted in grey) shown on the circa 1877 1st Edition OS 25" mapping.

Fig 19. Pipelines and related features (blue) revealed in the geophysical data.

Fig 20. The minimum extent of the area which should be excluded from any intrusive development activities at Trethosa.

Abbreviations

CRO	Cornwall County Record Office
EH	English Heritage
HER	Cornwall and the Isles of Scilly Historic Environment Record
HE	Historic Environment, Cornwall Council
MCO	Monument number in Cornwall HER
NGR	National Grid Reference
OD	Ordnance Datum – height above mean sea level at Newlyn
OS	Ordnance Survey
RIC	Royal Institution of Cornwall

1 Summary

Historic Environment Projects, Cornwall Council, was initially approached by Julia Edwards of Corylus Planning and Environmental Ltd. on behalf of Trethosa Solar Ltd. in Autumn 2012 with a request to provide undertake an assessment of a proposed solar farm at Trethosa Farm, St Stephen in Brannel covering an area of 10.7 Ha centred at SW 93909 54600. This initial project assessment consisted of a desk-based assessment and a walkover survey. The report (Sharpe 2012) recommended that a geophysical survey be undertaken to determine potential impacts on any sub-surface archaeology within the site.

Archaeophysica Ltd was commissioned by the client to undertake a magnetometer survey at Trethosa in June 2013 in line with a requirement from the Historic Environment Planning Advice Officer (central).

The geophysical survey revealed that the fields proposed for the development are underlain by a feature strongly resembling a round (an enclosed farmstead dating to the late Iron Age and the Romano-British period), together with a probably associated field system. The survey also indicated the location of two roundhouses of probably slightly earlier date, and a field system having an alignment different from that associated with the round and the roundhouses and that which is shown on historical maps and which is currently in use which may reflect the early post-medieval agricultural arrangement of the landscape.

Management options which would minimise damage to the archaeology of the site should the development go ahead were included within the report.

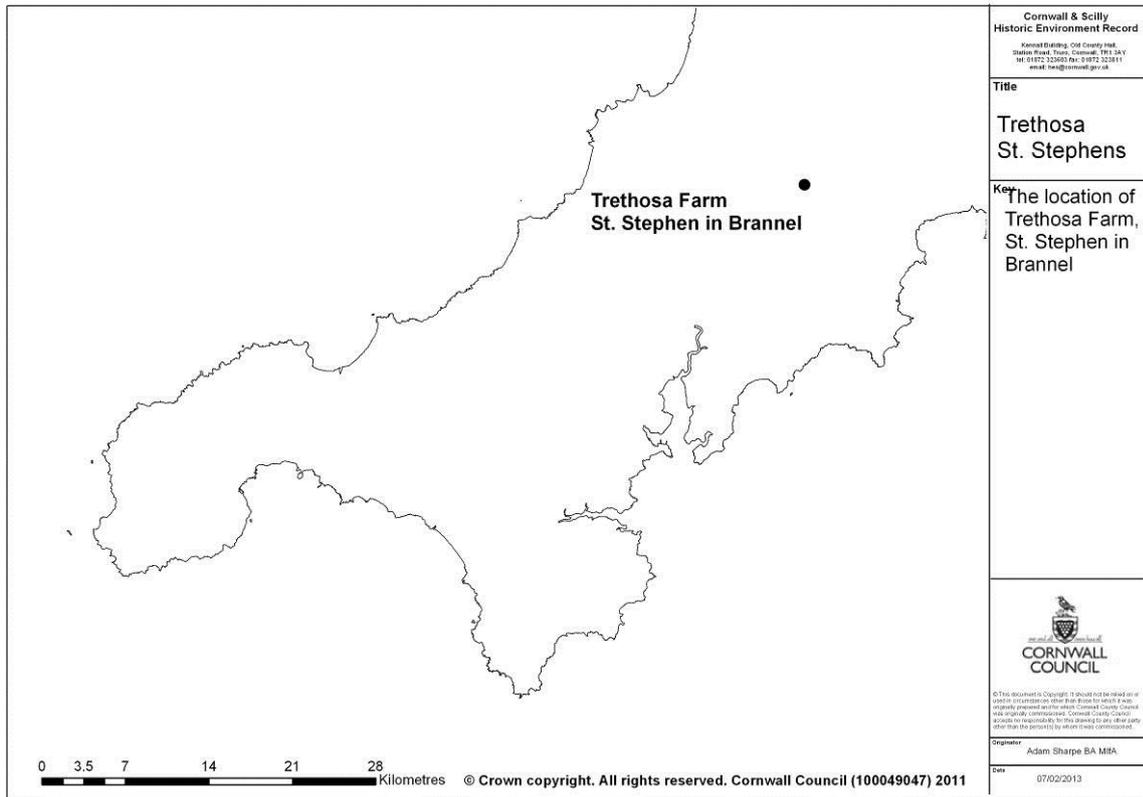


Fig 1. The location of Trethosa Farm.

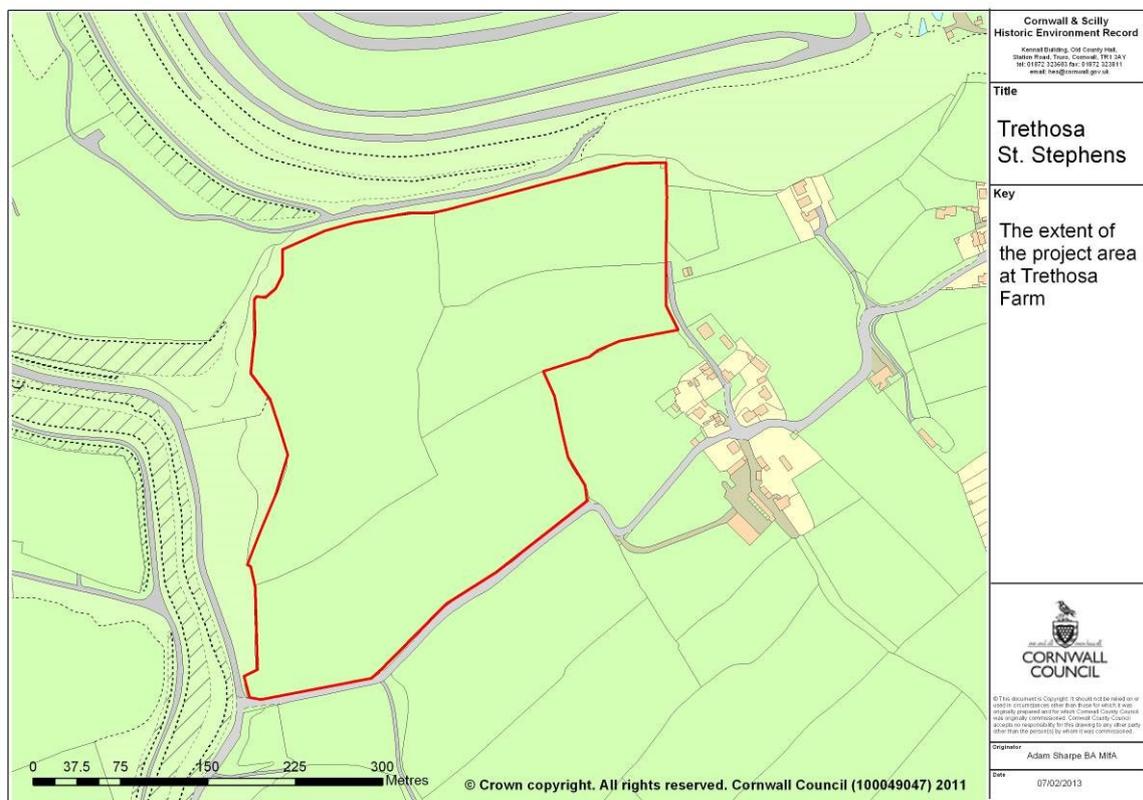


Fig 2. The extent of the project area at Trethosa Farm.

2 Introduction

2.1 Project background

Historic Environment Projects, Cornwall Council, was initially approached by Julia Edwards of Corylus Planning and Environmental Ltd. on behalf of Trethosa Solar Ltd. with a request to provide undertake an assessment of a proposed solar farm at Trethosa Farm, St Stephen in Brannel covering an area of 10.7 Ha centred at SW 93909 54600 (Figs 1 and 2). This initial project assessment consisted of a desk-based assessment, and a walkover survey. The report (Sharpe 2013) recommended that a geophysical survey be undertaken to determine potential impacts on any sub-surface archaeology within the site.

Archaeophysica Ltd was commissioned by the client to undertake a magnetometer survey at Trethosa in June 2013 in line with a requirement from the Historic Environment Planning Advice Officer (central).

2.2 Aims

The principal aim of the study is to gain a better understanding of the impacts which would result from the construction of a solar farm on land at Trethosa Farm in the parish of St. Stephen in Brannel.

The overall project aims are to:

- Collect and report on additional archaeological information about the development site in order to determine the potential direct impacts on the archaeology of the site which would result from the current proposal.
- To recommend any mitigation measures which might be required by the HEPAO to offset or mitigate any determinable impacts on the site.

The site specific project aims are to:

- Produce a report summarising the geophysical survey in interpreted form.
- Inform whether further archaeological recording or other mitigation is recommended in advance of, or during the development and operation of the proposed solar farm.

The objective of the project is to produce a report setting out the likely range of impacts of the development on heritage assets within the site and to make recommendations to the Historic Environment Planning Advice Officer relating to the development proposed for this site.

2.3 Methods

2.3.1 Desk-based assessment and ZTV mapping/analysis

Desk-based assessment and ZTV mapping and analysis were undertaken as part of the initial phase of site investigation undertaken in 2012 (Sharpe 2012, report 2013R006), as well as a site walkover survey.

2.3.2 Geophysical survey

A suitably qualified sub-contractor (Archaeophysica Ltd.) was engaged by Corylus Environment and Planning to carry out a geophysical survey of the fields proposed for the Trethosa solar farm.

Geometrics MagMapper G858 caesium vapour magnetometers were used to carry out the magnetometry survey, utilising a separate acquisition system. The sensors were set approximately 0.3m above the ground surface to maximise sensitivity whilst decreasing the effects of surface anomalies. Line separation was 1.0m to achieve a compromise between speed of coverage and lateral resolution. The along-line interval was 0.25m in line with English Heritage guidance.

A sledge mounted system was used to undertake the survey as this provides a faster rate of coverage, less ground contact and imparts less ground pressure than a walking surveyor; it also provides a more stable measurement platform. Real-time tracking was provided by a GNSS receiver, obviating the need to set out temporary grids. The driver of the quad bike towing the sledge also tracks information in real time, monitors data quality, positional accuracy and survey resolution.

Caesium vapour magnetic data collected in this fashion usually requires very little levelling to achieve a seamless sheet of data, an elementary corrections are usually limited to heading reduction and a little light smoothing. Heading reduction is a statistical process designed to reduce normal constant offsets between the zero or DC measurement from each sensor generated by slight rotational differences due to their manufacture. The sheet or mosaic is then subjected to normal potential field processing techniques including reduction of the background regional field and splitting of the resultant residual field into different depth models through analysis in the frequency domain. This yields the shallow data set, a model of anomalies within the upper 3m of ground and also a pseudo-gradient data set which models the response of a 1m vertical gradiometer, which can sometimes better reveal the edges of weakly magnetic structures.

The data was presented as a series of greyscale images overlaid onto map data geo-referenced to the OS grid. A separate catalogue map graphically highlights the most significant anomalies regardless of their origin; a numerical key to a detailed anomaly catalogue is included within the survey report text.

Alongside the catalogue, the report text includes a detailed methodological description and justification and analysis of the geophysical environment and its impact upon or presence within the data. Significant aspects of the results are discussed within the specialist's report.

2.3.3 Post-fieldwork

On completion of the project and following review with the HE Project Manager the results of the study were collated as an archive in accordance with: *Management of Research Projects in the Historic Environment (MoRPHE) English Heritage 2006*. The site archive will initially be stored at ReStore, with the eventual aim of deposition at Cornwall Record Office.

An archive report (this report) has been produced and supplied to the Client. This report will be lodged in digital form with the Cornwall and Scilly Historic Environment Record (HER) and made available for public consultation once a planning application for the site has been made. A copy of the report will be supplied to the National Monuments Record (NMR) in Swindon, to the Courtney Library of the Royal Cornwall Museum and to the Cornish Studies Library. All digital records will be filed on the Cornwall Council network.

An English Heritage/ADS online access to the index of archaeological investigations (OASIS) record has been made covering this project.

3 Location and setting

The site proposed for the solar farm is centred at SW 93909 54600 and is made up of four agricultural fields extending to 10.7 hectares. The site is located on the southern side of the Hensbarrow uplands on a south west facing slope (Fig 2). The former Maggie Pie mica lagoon is immediately to the west of the site, whilst both working and abandoned sections of the Trethosa (and Melbur) china clay works are to the north, north west and north east. The settlement of St Stephens in Brannel is one kilometre to the south.

The development area is characterised in the Cornwall and Scilly Historic Environment Record (HER) as 'Anciently Enclosed Land – Farmland Medieval': that is land whose boundary arrangements were substantially reorganised during the medieval period. Land with this historic landscape character is known to have a high potential for the survival of archaeological evidence deriving from prehistoric activity.

The solar farm is proposed to be sited at heights between 114m to the north east and 64m to the south west on soils recorded as being MANOD loams over shale, the bedrock being the Devonian Meadfoot Group, though the contact between the granite and these Devonian rocks lies close to the site.

4 Project extent

The archaeological assessment was focussed on those areas of the site which might be physically impacted upon by activities associated with the erection of the solar farm, including cable trenching, siting of temporary compounds or other equipment and with any associated temporary infrastructure.

5 Designations

5.1 National

None apply within the site.

5.2 Regional/county

No regional or county designations relate to the site proposed for the development. Two areas near Trethosa are Areas of Great Historic Value (AGHV), these being the Tregargus/Goonabarn Valley and St Stephen's Beacon.

5.3 Local

No local designations apply to the site proposed for the development.

5.4 Rights of Way

No rights of way traverse the sites proposed for the solar farm. This area is not registered as open access land under the CROW Act 2005.

6 Summary site history

See Sharpe (2013) for the full results of the desk-based assessment.

The site lies on the southern edge of the Hensbarrow uplands, just off the granite, and occupies land just to the west of the valley of the River Fal. The local landscape is notably dissected by small stream valleys but the general orientation of the landscape is to the south (Figs 5 and 6).

Archaeological evidence suggests that the reasonably fertile soils found in this area, combined with the semi-maritime climate and generally southerly aspect of the landscape would have long made this an attractive area to agriculturalists. This is evident in the significant number of rounds (enclosed farming settlements dating to the Romano-British period dating to c500 cal BC – AD 410) recorded within the landscape stretching south from the Hensbarrow uplands and the many farmsteads with pre-Conquest names which succeeded them, these being surrounded by extensive blocks of medieval fieldscape.

Hillforts which would have been local centres of power during the Iron Age survive on St Stephen's Beacon not far to the east (where there may have been a preceding early Neolithic hilltop enclosure), and other locations in the surrounding landscape.

Both the nearby Hensbarrow uplands and areas of low-lying valley bottoms would have been valuable resources for local agriculturalists throughout prehistory, into the medieval period and until the middle decades of the 19th century. The uplands, important sources of rough grazing and fuel during prehistory and in the medieval period, are the sites of documented Bronze Age barrow cemeteries, and in recent centuries have become the focus for intensive china clay quarrying. The valleys would have been important sources of timber during prehistory and were worked for their reserves of alluvial tin ore during the medieval period.

A large number of farming settlements succeeding the rounds were established within the areas fringing the exposed Hensbarrow granite uplands during the pre-Conquest period, the local parochial centre later being established at St. Stephen in Brannel. These farmsteads developed during the medieval and post-medieval periods, set within networks of long-associated fields. The majority of the nearby uplands remained unenclosed, and would have continued to provide rough pasture for the farms fringing the moors.

The *circa* 1840 St Stephen in Brannel Tithe Map (Fig 3) showed Trethosa Farm as being clearly of medieval origin, with fossilised strip field boundaries surrounding it on all sides, these indicating the locations and extents of former medieval cropping units. The land was owned by Lady Anne Grenville (daughter of Thomas Pitt, Lord Camelford), and by Lady Grenville and John Rouse, though all were tenanted by local farmers. Notably, the Tithe Award Apportionment (or Terrier) showed that Trethosa was occupied by a substantial number of artisans, most of whose trades related to the development of the china clay industry on the nearby Hensbarrow Moors. This aspect of the settlement became increasingly evident in the censuses dating to the following decades, some areas of former downland being parcelled up into smallholdings occupied by local china clay and china stone workers.

The 1880 OS map indicates some shrinkage in the population occurred towards the end of the 19th century, and there is evidence for attempts, through internal boundary removal, to make the originally small fields at Trethosa more amenable to improved farming methods (Fig 4).

7 Summary results of geophysical survey

Note, figures in square brackets relate to features shown on the geophysics catalogue map, Figures 13 and 14.

The geophysical survey results proved to be particularly clear and not significantly degraded by the effects of modern agricultural practices. Evidence for ploughed out boundaries which are either documented on archive maps (see Figs 3, 4 and 7) or are clearly additional elements of a post-medieval field system were revealed, particularly in the western part of the survey area (Figs 16 to 18). These do not all coincide exactly with those shown within this area on the *circa* 1840 Tithe Map and it is suggested that they may reflect a phase of agricultural reorganisation of this area of the farm during the period between 1840 and 1877 – perhaps a short-lived smallholding established in the fields making up the western fringes of the farm.

The current cross-contouring field boundaries can be seen in many cases to be those depicted on the 1840 Tithe Map (Fig 17), and these may in part represent fossilised strip field boundaries dating to the immediate post-medieval period. Evidence for cross-contour plough marks are visible across most of the site, though the deeper soils within the southern fields obscure these to some degree and in the north eastern part of the site they are far less evident, perhaps because of the proximity of the underlying granite/killas contact zone. There is also some evidence for contour-aligned ploughing,

particularly in the fields in the northern part of the site, this apparently being aligned with the 'modern' field system boundaries. A number of areas of evidence for probable ridge and furrow have also been highlighted on the interpreted data mapping within the south western part of the survey area. These are clearly of medieval date and underlie the 'modern' arrangement of field boundaries.

The geophysical survey has revealed further examples of ploughed out later period boundaries in the eastern part of the project area, providing a better idea of the field layout during the post-medieval period, revealing the nature of the current field layout prior to the removal of some internal boundaries (Fig 7). One boundary, at least [20], may be of greater significance, apparently running from the valley base to the west and on well beyond the settlement of Trethosa (Fig 8) – this may have been maintained as a long-standing boundary between separate landholdings, and is likely to be of at least medieval date, and appears from archive maps as being likely to have defined the southern edge of the landholdings of Rosavellan Farm to the north (this site and its fields now lie under Kernick mica tip). It may possibly be a perpetuated prehistoric or early medieval land division. This feature [45] was noted as a broad hollow at its eastern end during the walkover survey.

A further field system was also revealed (Fig 16). These boundary elements appear to be part of a separate field system on a different alignment both to that apparently associated with the round and the modern field system. This may be early medieval, medieval or post-medieval in date and may have incorporated some perpetuated elements of the earlier field systems described above. A possible enclosure [10/11] in the north western part of the survey area may be associated with this phase of landscape organisation, or to an earlier phase of occupation and use.

However, the most significant of the features revealed by the geophysical survey at Trethosa lie at the centre of the northern part of the survey area (Figs 11, 13 and 15). Up against the northern boundary, a sub-square enclosure measuring 44m x 44m in plan defined by an encircling ditch, almost certainly represents a late Iron Age/Romano-British enclosed farmstead of the type known in Cornwall as a **Round** [4/5/6]. The outer ditch around this feature [3] is slighter in form than the ditch defining the boundary of the farmstead; double-ditched rounds are not uncommon in Cornwall. Within the north western sector of the round, a number of features are visible within the data set, including a sub-square feature [5] which may represent a structure associated with the round, or alternatively may be an element of an underlying field system. The westernmost of the ditch terminals flanking the entrance to the round was evident within the data as an area of enhanced magnetism, but the eastern side of this entrance was less clearly defined.

The round appears to have a more shallowly-ditched sub-circular feature underlying its south western corner [7] (again, possibly part of an earlier field system) and a further semi-circular feature to its east. It also seems to be associated with a possibly multi-phase field system which is most clearly defined to the immediate west [8], south [13, 14, 16, 17, 21] and east [1/2] of the round, though other possibly associated elements extend across the eastern and south western parts of the survey area [34, 36]. This field system may extend beyond the survey area both to the north (under the mica lagoon which occupies parts of the former fields at Trethosa) and to the south (under the neighbouring fields). A number of hollows and pits (for example [18]) may also be contemporary.

The impression given is of an arrangement of relatively small enclosures associated with at least two roundhouses which were succeeded by a round during the late Iron Age/Romano-British period. These early field systems are clearly multi-phase and now only partially survive, making their interpretation difficult. It has been suggested that this round may have been a relatively short-lived feature within this landscape. It is not known whether this was a purely agricultural settlement, or had, in part, a more specialist role such as a centre for tin or iron smelting, as has been found at some comparable sites elsewhere within the landscape surrounding the Hensbarrow uplands.

The alignment of the now-destroyed post-medieval boundary which formerly defined the northern edge of the field within which the round lies seems likely, from evidence on the Tithe Award mapping and the 1877 OS mapping, to have been determined by the existence of the round as an earthwork feature at the time that the boundaries were laid out, suggesting that it survived into the post-medieval period as a relatively substantial landscape feature. Elements of the round, particularly its northern ditch line and the northern part of its eastern ditch line, were just visible as faint cropmarks on the 1946 RAF aerial photograph (Fig 9). It is assumed that the line of the western ditch circuit around the round underlies the adjacent field hedge.

A ring-ditch possibly associated with a roundhouse 9.2m in diameter [12] shows up in the data immediately adjacent to the southern side of the round near its probable southern entrance; the alignment of its entrance is unclear. Around 56m to the south of the round is a further oval ring-ditch possibly associated with a house of 10m/9m diameter [15] which has an east-facing opening. Both ring-ditches could be structural features, associated with roundhouses, which might either predate or be contemporary with the round; neither of the roundhouses appear to be slighted by any of the field boundaries which are apparently associated with the round. There are some hints of a possible third roundhouse near the southern edge of the survey area [41]. All three lie on more or less the same contour.

Phasing the features showing up in the geophysical survey (Figs 11 and 12) has not proved easy, though some educated guesswork can be used to group boundaries paralleling those shown on the Tithe Map or on the OS 1877 mapping, and to group other boundaries with similar alignments or which appear to show functional relationships. Nevertheless, as there appear to be at least three phases of boundary showing up in the data, the earliest of these exhibiting a possible sub-phase, it has not been possible to assign some boundary elements revealed by the geophysical survey to realistically secure periods.

The site is also notable for the linear services which show up strongly in the data (Fig 19). Most are likely to be large-sized drainage pipes, only one of which (following the hedgeline dividing the south western and north western fields) was recorded during the walkover survey at its western end, where it now runs from a discharge point over the field hedge north eastwards above the field boundary which it follows, elevated above it on concrete pillars supporting re-used rails before disappearing underground about half way along the boundary. The 1946 RAF aerial photograph (extract as Fig 9) shows that this originally followed a slightly different route at its western end (the sites of the supports show up in the geophysical data as [47, 48, 49]), crossing the road to the west. The 1930s OS 25" mapping (extract as Fig 10) showed this pipeline continuing 475m westward to the Trethosa Valley, to which it probably decanted water pumped from the clay pits to the north of Trethosa into the watercourse, though it might later have been re-used to feed material to the developing mica dam at Maggie Pie to the south west of the site.

Another, possibly smaller bore, pipeline was recorded to the south of this more or less paralleling the southern boundary of the survey area, and a further example has the same discharge point in the west on the edge of the valley as the first, but heads north north east towards the Kernick mica lagoon earthworks. A group of responses defining a square [9] in the north east corner of the survey area appears to represent the footings for a tower. This might have been associated with a further temporary pipeline arrangement or could possibly have been the site of a wind powered pump or a small water tower. Nothing is documented here on archive maps.

All of the major pipelines are thought most likely to have been established to take water or mica from the clay pits to the north to disposal areas in the former Trethosa Valley, though it has been suggested (Martin Roseveare pers. comm.) that the central pipeline might have tapped springs arising in the central part of the site. A further, small-scale non-magnetic linear feature near the western edge of the site [44] may represent a further small pipe or drain.

More or less parallel to the western boundary of the site, a contouring linear feature [29, 10] which appears to have its origin in the north-western corner of the survey area and which can be traced down to just to the west of the gateway near the south western corner of the survey area may well have been an early leat, constructed to carry water from the stream along the 76m contour and possibly serving a mine documented on the 1877 OS 25" mapping at Tolbenny just to the south, or a tin streamworks documented as having operated in the nearby valley. It is possible that this water course had its source at Kernick Mill not far to the north to which this area of the site was linked by a linear strip of woodland and disturbed ground on the 1877, 1907 and 1930s OS mapping. The 1840 Tithe Map hints strongly at a leat heading southwards from Kernick Mill in this direction and following this alignment. Possible pits such as [30/32/3/39/40] may represent industrial prospecting or small-scale extractive activity relating to the development of a nearby china clay works.

8 Significance

The survey has provided significant additional information relating to the long history of occupation and use of the site at Trethosa. Whilst further elements of its post-medieval field layout have been revealed, as well as a previously-unknown field system of indeterminate date (though which clearly predates the 'modern' layout), of greater interest is the data revealing the presence of a late prehistoric/Romano-British enclosed farming settlement (round) within the northern part of the survey area, together with elements of a probably associated early field system. The roundhouses sited to the south of the round may well have been contemporary with it, or may represent dwellings associated with a pre-existing open settlement of Iron Age date, other elements of which may well lie outside the surveyed area.

This is the first evidence for prehistoric activity at Trethosa, and helps considerably in developing our understanding of the pattern of late prehistoric occupation and farming within the area bordering the Hensbarrow uplands. The geophysical data suggests a strong potential for the survival of sealed, sub-surface deposits. As the area within which this evidence lies is likely to be occupied by the solar farm for the period of the permission, all efforts should be made not to disturb or destroy any sub-surface archaeological features or deposits which may, at some future date, be capable of provide detailed information about the lives of the people who occupied the site and the environment within which they lived.

9 Likely impacts of the proposed development

9.1 Types and scale of impact

Two general types of archaeological impact associated with solar farm developments have been identified as follows.

9.1.1 Types of impact, construction phase

Construction of the solar farm could have direct, physical impacts on the buried archaeology of the site through the emplacement of supports for the solar arrays, through the undergrounding of cables, as a result of the installation of a security fence around the solar farm, through the provision of any works compound, and with the construction of any temporary vehicle access ways into and within the site. Impacts on sub-surface archaeological features or deposits which might occur during this phase would be **permanent** and **irreversible**, but have the potential to be mitigated (see Section 10 below). The types of such potential impacts are discussed below.

9.1.2 Types of impact, operational phase

This solar farm might be expected to have a visual impact on the settings of some key heritage assets within its viewshed during the operational phase, given its extent, the topography of the site and that of the local landscape. Such factors also make it likely that the development would have some impact on Historic Landscape Character. These impacts would be **temporary** and **reversible** and were discussed in Sharpe 2013.

9.1.3 Impacts on archaeological sites within the development area

Ground disturbance associated with the installation of supports for the solar farm arrays, cabling, fencing or ancillary works during the construction phase could result in permanent, irreversible loss of below ground remains of archaeological sites within the development area, or of elements of these. The works, if deeper than current ground levels, might affect undetected buried cut features or intact sub-surface deposits.

Scales of impact will vary with the degree of significance of the individual features which may exist within the site and the proportion of each feature affected.

Potential adverse impacts on the sub-surface archaeology of the site may be capable of mitigation through archaeological recording or other interventions. A proposed mitigation strategy is outlined in Section 10 below.

10 Mitigation Strategy and recommendations

A range of means to mitigate the potential impacts identified in this assessment may be considered by the Historic Environment Planning Advice Officer (HEPAO), who may choose to recommend one or more of the following. Pre-application discussion with the HEPAO is strongly recommended.

10.1 Site redesign

The results of the geophysical survey suggests that, given the original proposed site layout, impacts on potentially significant sub-surface archaeology are likely to result from intrusive activities associated with the development of the solar farm at Trethosa, these potentially including the installation of array supports and boundary fencing, cable trenching, the construction of foundations for inverter buildings or transformer houses, and the construction of temporary site roadways. The HEPAO may request some degree of site design to limit such direct impacts on any significant sub-surface archaeology within the project area. This may include mounting selected arrays on surface-mounted concrete pads rather than on ground spikes, or, if the archaeology is thought likely to be susceptible to impacts resulting from this approach, for some areas of the site containing particularly sensitive below ground remains being excluded from the area covered by solar arrays. Features which should be excluded from intrusive activities include the round and the roundhouse sites, together with associated small enclosures and elements of the adjoining field system (Fig 20). This approach has the potential to reduce the impacts on any known sub-surface archaeology to **neutral**.

10.2 Archaeological evaluation trenching

In a case where a finalised site design would seem likely to result in unavoidable physical impacts on below ground features, a brief for work to determine the potential extent of these impacts would be prepared by Cornwall Council's Historic Environment Planning Advice Officer, setting out its scope. A Written Scheme of Investigation (WSI) to meet the brief would need to be prepared and agreed to establish and direct a programme of evaluation trenching to determine the significance of features revealed by geophysical survey and their potential for negative impacts.

10.3 Archaeological mitigation during the construction phase

Archaeological recording in the form of the recording of elements of the site which might be negatively impacted upon by works associated with the construction of the finalised agreed site design could be achieved through a controlled soil strip under archaeological supervision or an archaeological watching brief (observation by an archaeologist during mechanical ground reduction activities). Either might be required where any below-ground archaeological assessed as being of significance are likely to be disturbed, or where it is assessed that there damage to sub-surface archaeology not susceptible to recording by the geophysical survey has the potential to occur. This approach provides for preservation by record of upstanding or buried archaeological features, artefacts or deposits and would reduce any impacts on the known archaeology of the site to **negative/minor**.

11 References

11.1 Primary sources

Cornwall County Council 2005 aerial mapping of Cornwall.

Joel Gascoyne's 1699 Map of Cornwall

Martyn's 1748 Map of Cornwall

Ordnance Survey, 1809, *1 inch mapping* First Edition (licensed digital copy at HE)

Ordnance Survey, c1880. *25 inch Map* First Edition (licensed digital copy at HE)

Ordnance Survey, c1907. *25 inch Map* Second Edition (licensed digital copy at HE)

Ordnance Survey, 2007. *Mastermap Digital Mapping*

Tithe Map and Apportionment, c1840. *Parish of St. Stephen in Brannel* (digital copy available from CRO)

Sharpe, A. 2013, *Trethosa Farm, St. Stephen in Brannel: archaeological assessment of proposed solar farm*, Historic Environment Projects report 2013R006

11.2 Publications

English Heritage 2011, *The setting of Heritage assets: English Heritage guidance*

Herring, P. 1998, *Cornwall's historic landscape: presenting a method of historic landscape character assessment*, Cornwall Archaeological Unit

11.3 Websites

English Heritage's online database of Sites and Monuments Records, and Listed Buildings - <http://www.heritagegateway.org.uk/gateway/>

12 Project archive

The HE project number is **146248**

The project's documentary, photographic and drawn archive is housed at the offices of Historic Environment, Cornwall Council, Fal Building, New County Hall, Treyew Road, Truro, TR1 3AY. The contents of this archive are as listed below:

1. A project file containing site records, project correspondence and administration.
2. English Heritage/ADS OASIS online reference: cornwall2-154073

This report text is held in digital form as: ..\HE Projects\Sites\Sites T\Trethosa geophysics 2013\Trethosa geophysics report.doc

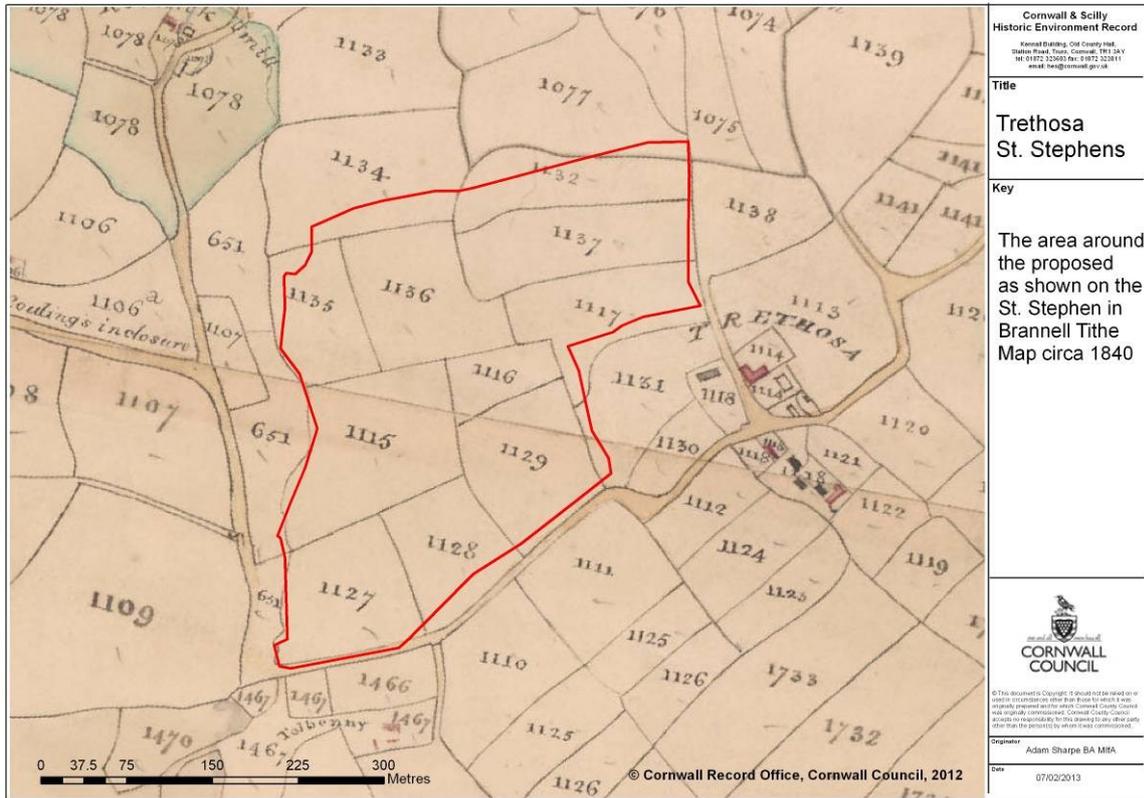


Fig 3. The project area as shown on the circa 1840 St Stephen in Brannel Tithe Map.

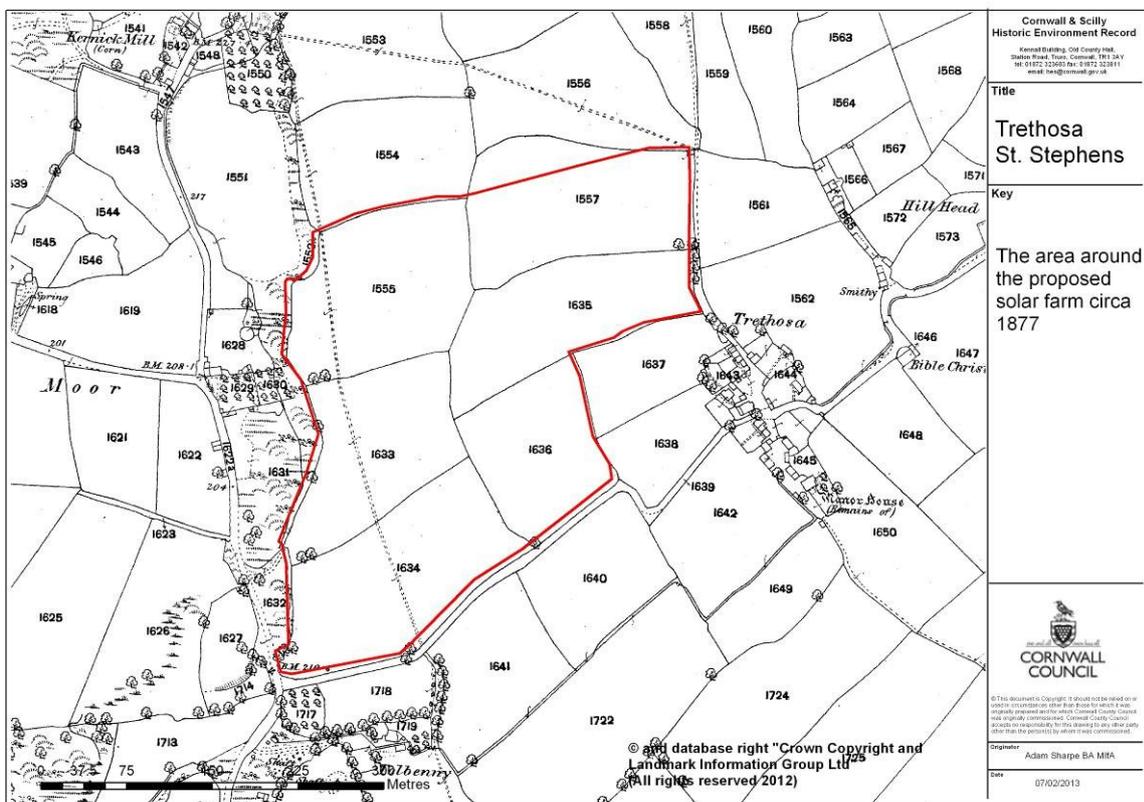


Fig 4. The project area as shown on the circa 1877 1st Edition OS 25" to the mile mapping. Note the boundary rearrangements near the centre of the survey area.



Fig 5. The project area as shown on a 2005 CCC aerial photograph. Note the extent of boundary removal since 1877.



Fig 6. The view north from the A3058 at Halivack towards the site proposed for the solar farm, which consists of the fields to the left of the farm lane to Trethosa (right centre).

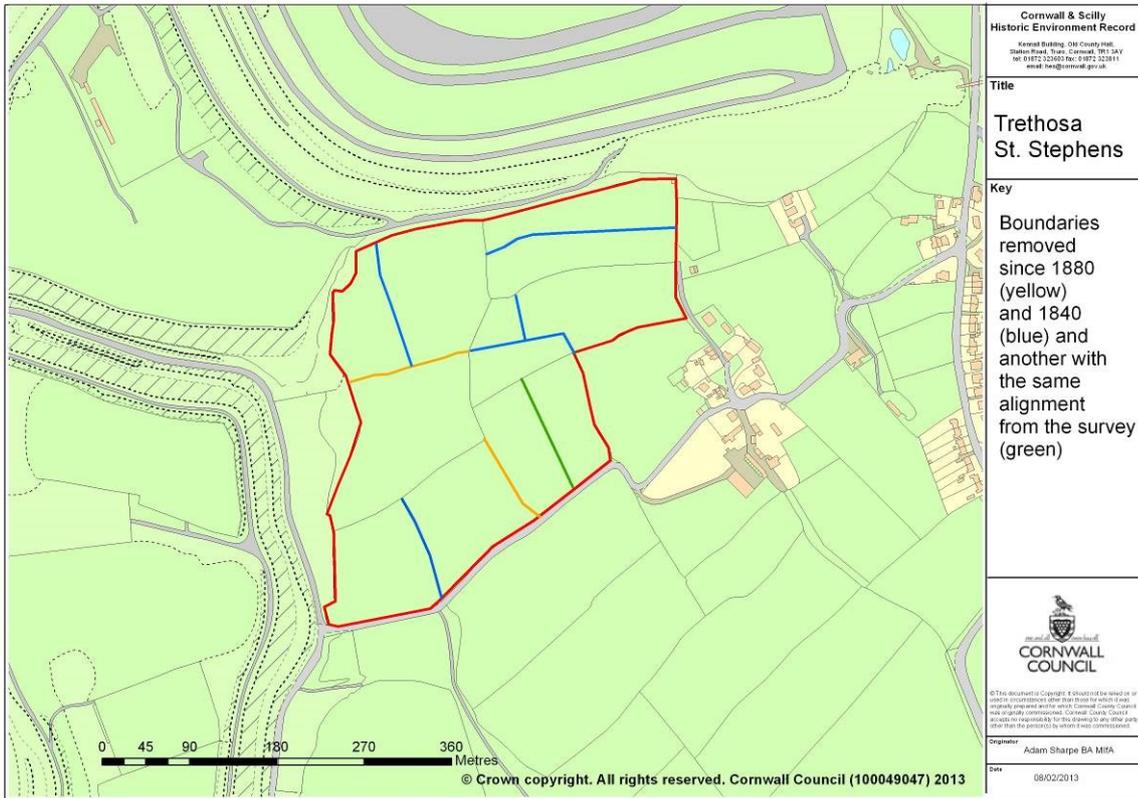


Fig 7. Documented removed field boundaries at Trethosa.

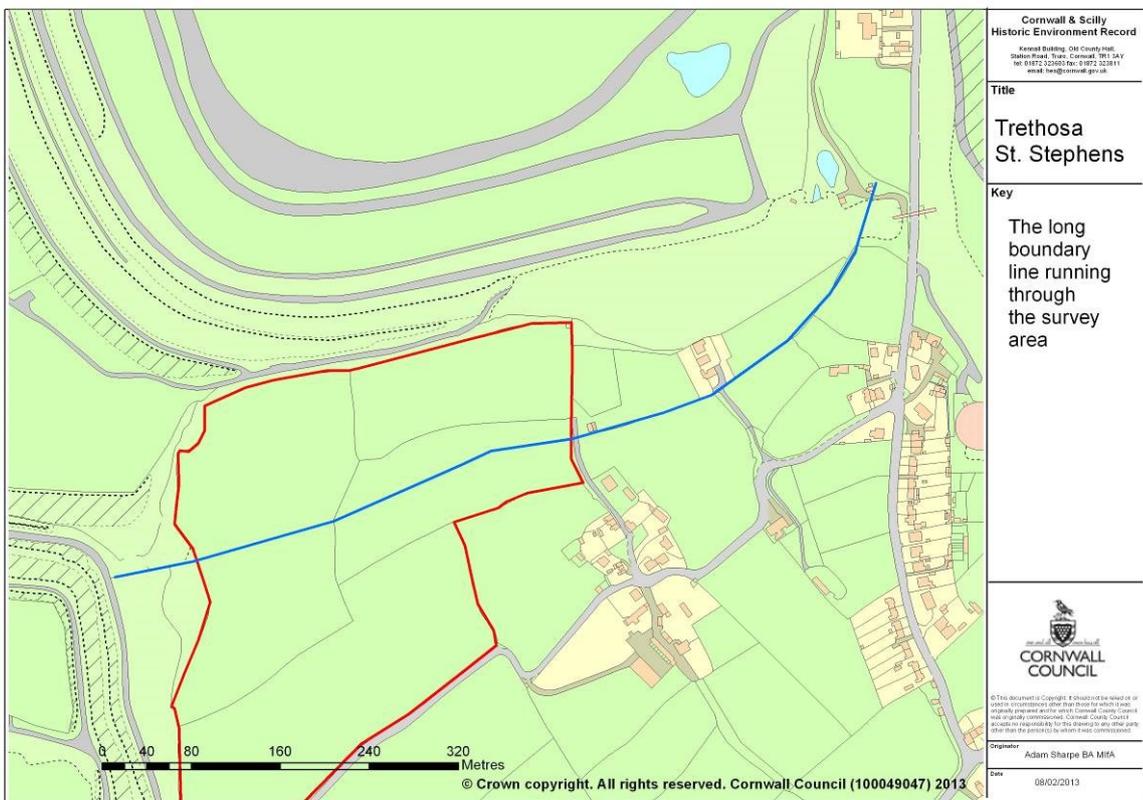


Fig 8. The long boundary running through the survey area which is likely to be of medieval or earlier date.



Fig 9. An extract from the RAF 1946 aerial photographic mapping from Trethosa. Note the pipeline crossing the south western field and the faint cropmark evidence for the round (circled in red). © English Heritage (NMR) RAF Photography

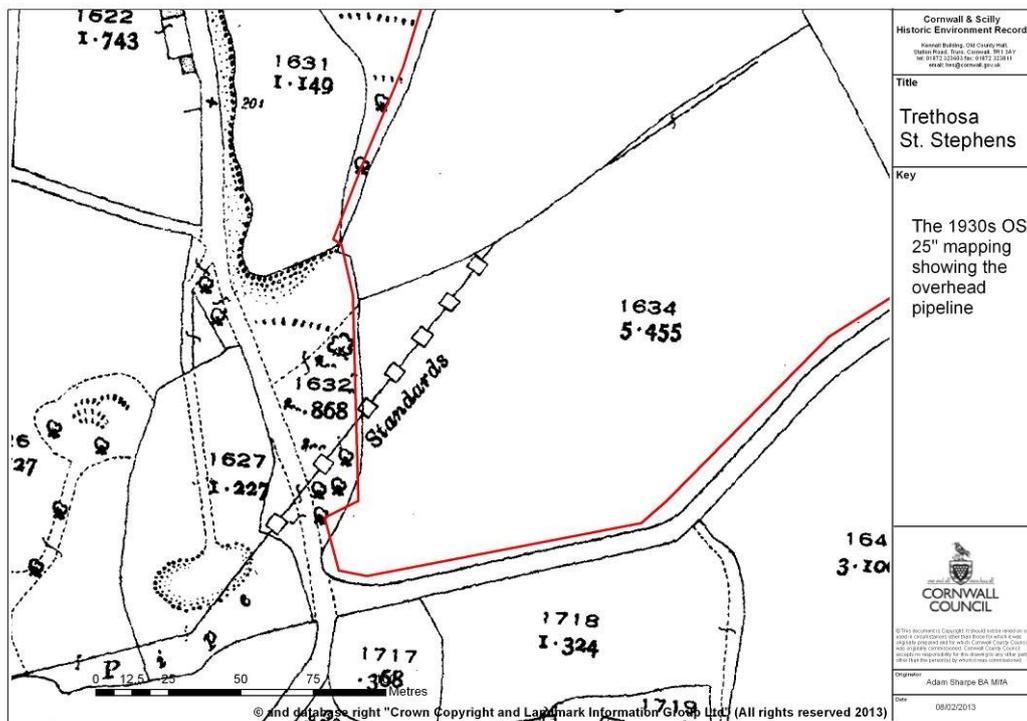


Fig 10. An extract from the 1930s OS 25" mapping showing the overhead pipeline in the south western part of the site.



Fig 11. The geophysical survey data for the northern half of the survey area.



Fig 12. The geophysical survey data for the southern part of the project area.

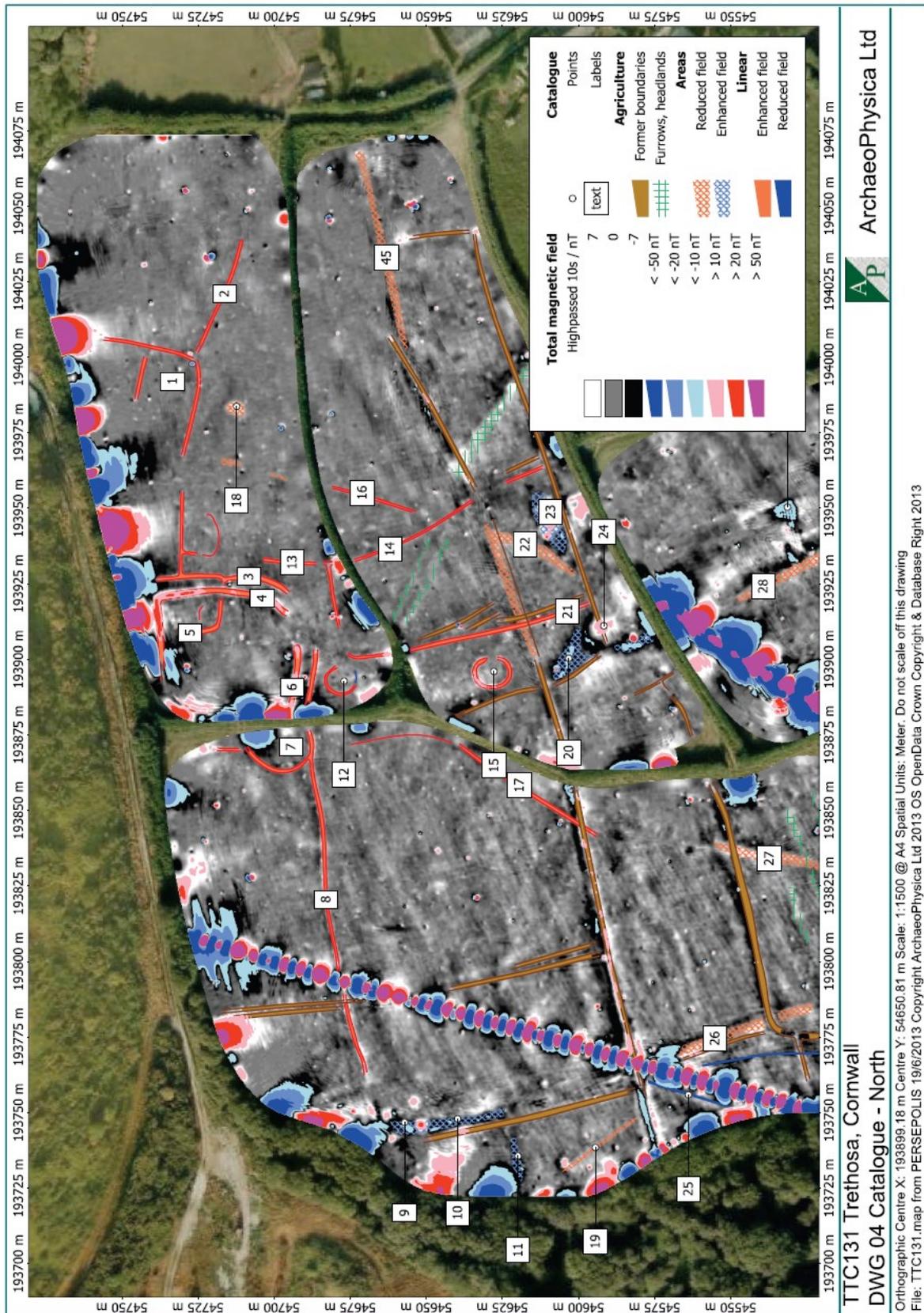


Fig 13. The interpreted geophysical survey data for the northern part of the site.

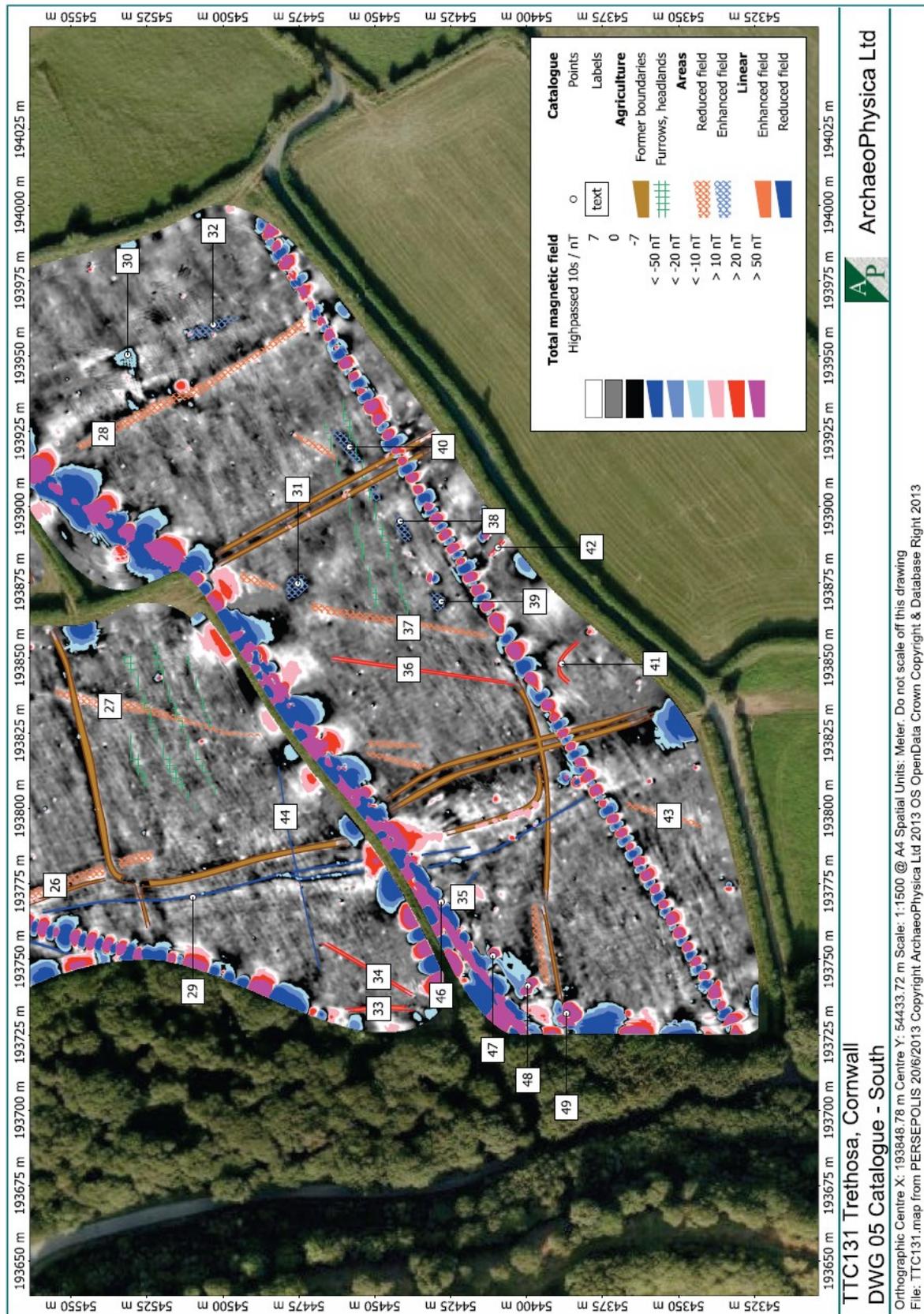


Fig 14. The interpreted geophysical survey data for the southern part of the site.

Geophysical survey feature catalogue

Label	Anomaly Type	Feature Type	Description	Easting	Northing
1	Linear enhanced dipolar (group)	Fills - Ditches	A series of narrow ditch fills define enclosures extending east from the round (ditch fills [4] and [6]) and seem likely to be contemporary with this although [5] appears to enter the round from [3] while being part of the same complex of enclosures	193992.0	54733.3
2	Linear enhanced dipolar	Fill - Ditch	Possibly indirectly connected with [1] this ditch fill extends ESE and implies a continuation of the likely prehistoric field system	194021.0	54716.2
3	Linear enhanced dipolar	Fill - Ditch	Approximately 6m outside the round ditch [4] (and [6]) is a second ditch that appears to be concentric with the round and integral to the field system. It seems to be slightly narrower than the inner ditch, less than 2m wide	193927.3	54708.3
4	Linear enhanced dipolar	Fill - Ditch	The ditch fill defining the round appears to vary slightly in width from a minimum of about 2m to about 3m at the NE corner. There appears to be a wide entrance through the southern arc although this section of fill lacks a clear terminal, unlike [6] to the SW	193920.2	54703.9
5	Linear enhanced dipolar	Fill - Ditch	A small enclosure measuring about 11m east-west at least 11m north-south might exist within the round, however, it is equally likely to be part of the field system defined by [1] as fill [3] appears to turn towards the east end of fill [5]	193908.8	54727.6
6	Linear enhanced dipolar	Fill - Ditch	See [4]; this section has a clear ditch terminal which is also slightly more magnetic than the adjacent section of ditch fill	193890.8	54694.0
7	Linear enhanced dipolar (group)	Fills - Ditches	The extent of the small oval enclosure defined by ditch fill [7] is uncertain because it passes beneath the present field boundary which has a wire fence and thus masks anomalies to each side. The western arc of the round is invisible for the same reason but probably co-incides with the field boundary. If so, enclosure [7] seems to be a swelling westwards of the circuit implied by [3] and onto which [8] might join, although this could be an unrelated later field boundary	193871.0	54694.4

Label	Anomaly Type	Feature Type	Description	Easting	Northing
8	Linear enhanced dipolar	Fill - Ditch	This appears to be a field boundary however it might also be associated with [7] and therefore [3]. If so, it could also be interpreted as a continuation of the field system defined by [1], however, this is not entirely convincing	193820.5	54682.9
9	Discrete strong enhanced (group)	Structure	A group of four discrete and strongly magnetic (10 - 20 nT) define the corners of a rectangle measuring approximately 7.7m x 10.6m with each source less than 2m in diameter. A logical explanation is that these represent the buried feet of a former structure, identity unknown	193746.7	54657.1
10	Area reduced	Fill / structure / natural	A band of less magnetic ground, sometimes typical of a stony fill, has a width of 3m and extends at least 40m north to south parallel (perhaps fortuitously) to a former field boundary ditch. If [11] is also part of the same feature then between them they suggest the former presence of some sort of enclosure. The band is overlaid by structure [9]	193747.9	54639.6
11	Area reduced	Fill / structure / natural	See [10]; this example is perpendicular to it and might be part of the same structure	193735.6	54619.8
12	Linear enhanced dipolar	Fill - Ditch	A very weakly magnetic possible ditch fill might define a ring ditch of approximately 9m diameter although this is a tentative identification	193892.8	54676.9
13	Linear enhanced dipolar	Fill - Ditch	A narrow ditch fill, apparently extending [14] northwards as if to become concentric with [3] and to thus define a third circuit of the round on the east side	193932.1	54694.0
14	Linear enhanced dipolar	Fill - Ditch	With [21] this seems to define a sub-rectangular enclosure of likely prehistoric form measuring about 80m long and 48m wide at the southern end, tapering to about 32m at the northern. It is apparently crossed (and therefore cut?) by a major former land division (and itself probably predating the present field system) [20] and [45]	193936.4	54661.9
15	Linear enhanced dipolar	Fill - Ditch	A strongly magnetic ring ditch measuring approximately 10m north - south and about 9m east - west and probably the eaves drip of a prehistoric hut with an east facing (and uphill) entrance. There is no sign of internal features	193896.0	54627.7

Label	Anomaly Type	Feature Type	Description	Easting	Northing
16	Linear enhanced dipolar	Fill - Ditch	Possible former enclosure ditch, however, this is not certain and the alignment with [22] may be coincidence as it seems likely the two anomalies are caused by different sorts of feature	193955.1	54671.0
17	Linear enhanced dipolar	Fill - Ditch	See [16], this time apparently approximately aligned with [27] though again whether an association between these should be made is dubious	193858.3	54619.4
18	Area enhanced (sample)	Fill - Pit / natural?	Possible oval pit fill approximately 5m north - south by 3.5m east - west, however, similar structures can sometimes be natural	193983.7	54712.3
19	Linear enhanced	Fill? - Ditch?	Uncertain	193738.4	54594.4
20	Area reduced	Fill / natural?	An area of strongly reduced magnetic field might indicate disturbed ground, perhaps stony fill within a hollow. This is one of two groups of anomalies, the other being [23], that comprise both low and high field anomalies (see also [24]). It is possible that these relate to water collection as a pipeline once originated in this area and therefore the presence of springs is implied	193900.3	54603.1
21	Linear enhanced dipolar	Fill - Ditch	See [14]	193915.8	54603.5
22	Area enhanced	Fill - Cultivation / natural?	A band of magnetic ground almost 3m wide trends NE - SW and would be characteristic of a fairly deeply buried magnetic source. Despite appearances and the apparent continuation of ditch fill [16] it is possible that this anomaly and others aligned with it have a geological origin. See also [27] and [37]	193938.0	54617.4
23	Area various strong	Fill / natural?	See [21]	193948.7	54609.1
24	Discrete strong dipolar	Fill / natural?	See [20]. This could be due to geochemical changes in the soil generated by processes like cyclic waterlogging, or alternatively debris within a hollow	193911.0	54591.6
25	Linear reduced	Fill / structure	Possible non-magnetic service or culvert. Interestingly it is parallel to a buried water pipe and might therefore have fulfilled a similar function as supports [46] - [49] for a pipe or launder have also been replaced by a buried pipe	193755.9	54563.8

Label	Anomaly Type	Feature Type	Description	Easting	Northing
26	Area enhanced	Fill - Ditch?	A band of magnetic ground almost 5m wide runs alongside a former field boundary and therefore might relate in some to this, however, it seems to continue southwards into the next former field and hence might be an older feature. It is one of a number of linear anomalies along the west edge of the survey and together these might indicate a corridor of former activity, perhaps unrelated to agricultural use of the land	193774.5	54555.1
27	Area enhanced	Natural / fill?	See [22]	193834.0	54537.2
28	Area enhanced	Fill? - Ditch?	This appears to be a former field boundary and the area of magnetic ground could imply it to have been a lynchet rather than a ditch, although there may also be a ditch fill buried within it	193924.1	54539.2
29	Linear reduced	Fill / structure	A narrow (< 1m) wide reduced field anomaly can be traced for over 180m southwards and would likely be caused by a culvert or similar stony or large air-filled structure, or possibly a peat-rich fill within a ditch. It seems likely, given that it follows a contour, that it was leat or similar structure for the conveyance of water. It appears to have been modified, perhaps re-routed slightly as for about 60m two such anomalies run parallel 4m apart	193770.5	54509.9
30	Area reduced	Natural / fill?	A number of discrete areas of reduced magnetic field are found across the southern part of the survey and lack an obvious explanation. Many (e.g. this and [32]) seem to be aligned though groups have differing alignments and are therefore not totally convincing as geological structures. They cross former field boundaries which suggests a natural or ancient origin and they could be backfilled excavations, perhaps small quarries or prospecting pits although this identification is tentative at best	193950.3	54531.3
31	Area reduced	Natural / fill?	See [30]	193874.5	54475.3
32	Area reduced	Natural / fill?	See [30]	193960.2	54503.1
33	Linear enhanced dipolar	Fill - Ditch	A narrow ditch fill of unknown function	193733.6	54448.7
34	Linear enhanced dipolar	Fill - Ditch	A narrow ditch fill of unknown function	193744.3	54448.7

Label	Anomaly Type	Feature Type	Description	Easting	Northing
35	Linear reduced	Fill? / structure?	Possible non-magnetic structure, a tentative identification, although there might be some association with [29]	193770.5	54421.0
36	Linear enhanced dipolar	Fill - Ditch	Parallel to [37], this appears to be a former field boundary but not part of the medieval or post-medieval system of Cornish hedges	193845.9	54438.8
37	Area enhanced	Natural / fill?	See [27]	193859.8	54438.8
38	Area reduced	Natural / fill?	See [30]	193895.2	54441.6
39	Area reduced	Natural / fill?	See [30]	193868.6	54428.1
40	Area reduced	Natural / fill?	See [30]	193919.8	54458.3
41	Linear enhanced dipolar	Fill - Ditch?	Uncertain	193847.9	54388.4
42	Linear enhanced dipolar	Fill? - Ditch?	Uncertain	193886.4	54409.5
43	Area enhanced	Natural / fill?	See [27]	193797.5	54353.1
44	Linear reduced	Fill / structure - Service?	Possible non-magnetic service, e.g. a drain	193797.1	54479.3
45	Area enhanced	Fill - Ditch?	With [20] and extant boundaries to the east this forms parts of a long linear land division that appears to have extended for 700m and to predate the former field system. It could therefore be an early medieval or prehistoric division, surviving partly as ditch fills and earthworks	194032.9	54663.1
46	Discrete strong dipolar	Structure	An aerial photograph of the 1940s (Sharpe, pers. comm.) shows an aqueduct crossing this corner of the field with piers supporting either a pipe or a launder. This was evidently replaced by the buried pipe laid along the field edge to the north and appears to have collected water from the area of [23] and [24]. The anomalies suggest the piers to have been either of steel or reinforced concrete and possibly increasing in extent towards the southwest which would be in keeping with them increasing in height further downhill. The pier bases are at approximate 15m intervals	193769.0	54428.1
47	Discrete strong dipolar	Structure	See [46] which is another in the series	193751.1	54411.0

Label	Anomaly Type	Feature Type	Description	Easting	Northing
48	Discrete strong dipolar	Structure	See [46] which is another in the series	193741.2	54399.5
49	Discrete strong dipolar	Structure	See [46] which is another in the series	193732.0	54386.8



Fig 15. Features (in red) interpreted as prehistoric boundaries and structures and (in orange) as possible prehistoric boundaries.



Fig 16. Features (highlighted in grey) as interpreted as belonging to a medieval or early post-medieval field system.

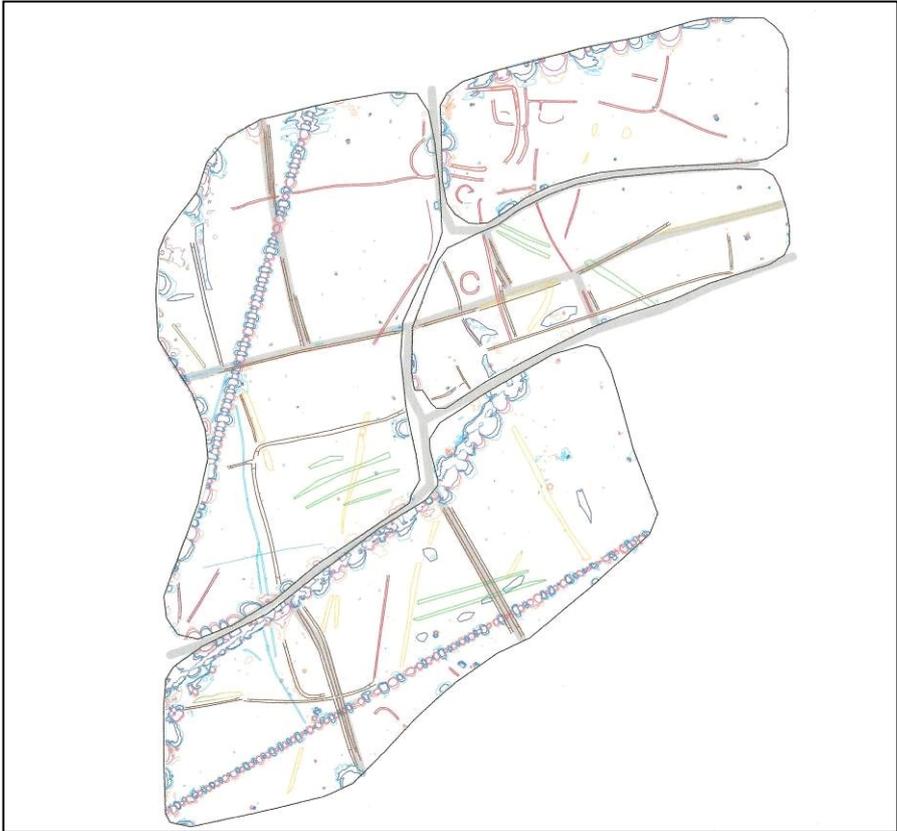


Fig 17. Boundaries (highlighted in grey) shown on the circa 1840 Tithe Map.



Fig 18. Boundaries (highlighted in grey) shown on the circa 1877 1st Edition OS 25" mapping.



Fig 19. Pipelines and related features (blue) revealed in the geophysical data.

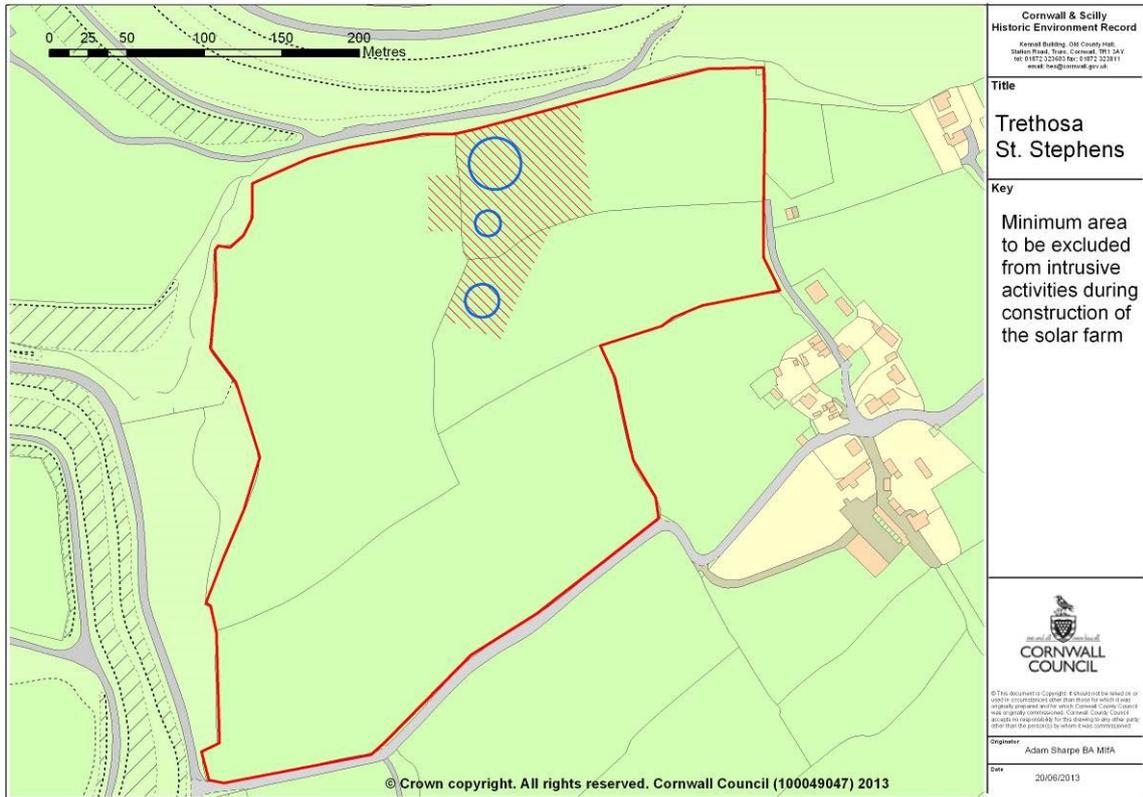


Fig 20. The minimum extent of the area which should be excluded from any intrusive development activities at Trethosa. Blue circles= Round and round houses; hatched area = buffer zone.