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Geophysical survey of Castle Ditches, Llantwit Major, Vale of Glamorgan

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Abstract

An area of 1.5ha centred at [SS 960674] within the promontory fort of Castle Ditches was surveyed by magnetic gradiometry.

Castle Ditches is a Scheduled Ancient Monument (SM GM019, PRN 447S) and lies with the Cwm Colhuw Nature Reserve.

The survey was designed to investigate nature of any occupation within the defences and the relationship between any surviving internal archaeological features and the currently rapidly-eroding coastline.

The survey was initially attempted during the very bad weather during Storm Jorge in spring 2020, but any subsequent resurvey was delayed by the Covid19 pandemic. The area was then fully resurveyed during April 2021.

Some small areas within the survey area were inaccessible because of low bramble growth (which could not be cleared because of breeding birds).

The survey showed three groups of magnetic anomalies:
- a group of broad, somewhat diffuse, positive linear magnetic anomalies of variable amplitude and mostly in a SSW-NNE direction (locally NNW-SSE). These are interpreted as being of geological origin.
- an arcuate compound magnetic anomaly corresponding ot the location of a small ditch and bank interpreted to be a post-medieval field boundary. This is parallel to a set of parallel, spaced curvilinear positive magnetic anomalies associated with low amplitude and short wavelength ridge and furrow visible on LiDAR data (this set of anomalies strongest over the areas with evidence for Iron Age occupation). The ridge and furrow is cross-cut by a second linear, dominantly a negative magnetic anomaly, corresponding to another late small earthwork.
- a group of smaller anomalies including possibly as many as 16 narrow penannular positive anomalies of 8 to 12m diameter (amplitudes typically <2nT/m), together with a series of smaller positive areal anomalies with amplitudes of up to 8nT/m. these anomalies are interpreted as a series of roundhouses with associated pits and possibly hearths.

The interior of the fort thus shows significant evidence for occupation over a swathe behind and less than 35m from the modern cliff line, and it is assumed that similar occupation areas have already been lost to erosion. Loss since 1880 is estimated to be over 20m at the west of the site reducing to around 10m at the east.

The Iron Age or Romano-British occupation, was followed by ridge and furrow cultivation in the medieval period over an area which was converted into small enclosures probably in the early post-medieval. The site seems to have formed a single field since at least 1840.

Contents

Methods

Survey rationale and background

The initial survey was undertaken as part of the field element of Cardiff University Archaeology Department's module HS2314 'Surveying and Prospecting' for 2019/20. The Cardiff University surveys have the overall theme of improving understanding of the Romano-British landscape within which the Caermead villa and other sites are situated. The assistance of Dr Alan Lane is gratefully acknowledged.

The initial survey was undertaken during the very bad weather of Storm Jorge in spring 2020. The physical conditions led to very poor data quality and a limited extent for the survey, but any subsequent resurvey was delayed by the Covid19 pandemic. The area was then fully resurveyed during April 2021.

The second survey was undertaken partly as completion of the task started in 2020 and partly as a contribution to the research of Dr Oliver Davies, Cardiff University, whose support is also gratefully acknowledged.

An area of 1.5ha centred at [SS 960674] within the promontory fort of Castle Ditches was resurveyed by magnetic gradiometry in 2021.

The underlying geology is the Porthkerry Member of the Jurassic Blue Lias Formation, which comprises alternating limestones and shales. The interior of the fort has been used for grazing horses as part of the environmental management of the reserve.

Castle Ditches is a Scheduled Ancient Monument (SM GM019, PRN 447S) and lies with the Cwm Colhuw Nature Reserve. The work was undertaken under a S42 licence from Cadw and with the assistance of Vaughn Matthews, reserve warden for the Wildlife Trust of South and West Wales.

The survey was conducted to CIfA (2014) and EH (2008) guidelines.

Historical and archaeological background

The Castle Ditches promontory fort has received relatively little archaeological attention. The description by the RCHAHMW (no 668: p39-40) is very short and the plan of the defences is superseded by modern LiDAR imagery (e.g. Figure 12).

Trevelyan claimed that coins of Carausius had been found in the interior of the fort (Trevelyan 1910, 16). The interior has also been the subject of recent illicit metal-detecting.

The site was reviewed by Sell (2000) and some geophysical investigation was undertaken (Barker & Mercer 2000, appended to Wiggins & Evans 2005). This survey revealed evidence for Iron Age occupation was limited to the SE corner of the site. Recent watching briefs on activities have included one on renewal of a gatepost in the NE corner (Hall & Sambrook 2015) and one on renewal of fencing along the clifftop (unpublished).

The earliest historical reference to site may be the account in Chapter 26 of the 12th century 'Life of Illtyd' (Wade-Evans 1944) of a raid by the 'army of Gwynedd' during the late 11th century, during which the townsfolk 'fortified themselves by means of a ditch and by means of a hedge firmly made above the sea shore'.

LiDAR data show the area to have a very slight, narrow (5m) ridge and furrow. Upon this is superimposed tow field boundaries – one towards the eat forming a low bank and ditch following the earlier furrows, the other to the west a slighter feature cross cutting the ploughing. The line of the ridges suggests they were created when the clifftop was significantly south of its present position. The curvilinear field boundary appears as an earthwork on all editions of OS mapping, but the lesser, straight, boundary appears on none.

The area formed part of the demesnes of the Lord of Glamorgan after the Norman invasion. A significant area of pasture and woodland at Coytlow or Cailowe was retained by the manor. This remained held with the Boverton estate (the major part of the demesnes lands) until very recently. The estate was held by the Seys family from the late 16th century until it passed by marriage to Jones of Fonmon in the 1760s. It had been mortgaged to William Thompson, Harry Goring and Elias Vander Horst in the early 19th century, before passing first to Isaac Harris Wrentmore, and then in 1817 to John Tunno, who sold it to Josiah John Guest in 1838.

Some 17th century documents concern a property known as 'Castle Close': this was leased by Richard Seys to Henry Deere for £3 pa for 21 years from 20th September 1626 (GRO DF/D/781), with a second document of the same day (GRO DF/D/784) acting as a bond for free passage to/from that close, and was later leased by Evan Seys to Thomas Nicholl (28th Sept 1677; GRO DF/D/73). On the same date the same parties agreed to a lease of the woods of Whither Hill, believed to be a part of the Colhuw valley sides. It

seems quite likely that 'Castle Close' was the property known as 'Castle Meadow' in the Tithe Survey. The references to the property, if correctly identified, as a 'close' during the 17th century may possibly suggest arable use at this time. A close called 'Castle Ditches' was leased by the Earl of Pembroke to Richard Seys on 30th Sept 1633 (GRO DF/D/2429); it is unclear if this is the property to the east of the survey area, so-named in 1840. A list of properties of the Boverton estate (mid-18th century?; GRO D/DF E/18), lists an 8a parcel 'Castle Ditches & Colhue wood'. The 1840 Tithe survey lists the interior of the fort as 'Castle Meadow' (7a 2r 23p; equivalent to 3.09ha) which was pasture. For comparison, the area within the crest of the inner rampart is now 2.14ha; if the difference was from coastal erosion, then the internal area decreased by 30% from 1840 to present (but the precise line of the field boundary is unknown). The area enclosed by the top of the surviving inner bank was approximately 2.45ha at the time of the OS survey of 1880, suggesting a more modest 13% reduction. The eastern defences appear to have been grouped with a field to the east, known as 'Castle Ditches' (16a), under separate ownership (this field is plot 906 on the 1st Edition OS.

Survey layout

The survey was laid-out using a Trimble survey-grade RTK GPS system (5700 base station and 5800 rover). A temporary base-station was located near the northeastern margin of the area. The survey was staked out to design locations at 20m intervals of National Grid using the Trimble 5800 rover. The grid pegs were positioned to within 40mm of the relative design location reported by the GPS. The survey was post-processed using the *datfixweek*, *convert-to-rinex* and *rinexweek* utilities, to produce rinex files from the logged GPS data and from the nearest 6 OS-Net stations, backdated to permit baseline process in *Trimble Geomatics Office*. The resultant GPS accuracy coupled with survey pegging tolerances means that all grid locations are known to within 50mm.

LiDAR survey

The LiDAR data examined during production of this report are derived from the publicly-accessible 2m-pixel LiDAR DTM dataset (http://lle.wales.gov.uk/GridProducts#data=LidarCompositeDataset). The DTM data were download as ASCII files, imported into *Surfer* for imaging. The LiDAR data are illustrated in Figure 2.

Magnetic gradiometry

Magnetic gradiometry was undertaken with a Bartington Grad 601 Dual fluxgate gradiometer. Data were collected at 0.125m intervals on traverse 2m apart, giving an effective traverse interval of 1.0m (singe density; a data grid of 0.125m x 1.0m). Grids were walked on South to North traverses in a zig-zag pattern. Data were downloaded from the instrument, assembled and cleaned using DW Consulting's 'Terrasurveyor Lite v3' software. The grids were assembled, the data clipped and the destriping function employed for data in which there was an imbalance between the two gradiometers. No additional processing or filtering was applied. The data were then exported from Terrasurveyor and interpolated to a 0.125m node-spacing using Golden Software's Surfer package to reduce pixilation where required.

Use of this report

The main technique chosen for the survey, magnetic gradiometry, was chosen because this tool can provide information on a wide range of cut and other features where the fill and substrate have sufficient contrast in magnetic susceptibility, as well as features with significant remanent magnetism.

Absence of detectable geophysical anomalies cannot be taken as indicative of the absence of archaeological features. All anomalies have been interpreted as far as possible, with contrasting possible interpretations given where appropriate. Geophysical techniques cannot provide an unambiguous evaluation of buried features. Where a higher degree of certainty is required, physical ground-truthing of any geophysical anomalies resolved by the survey will be required.

Results

There were no technical issues with the set-out. Some areas were inaccessible because of low bramble growth, which could not be cleared, partly because of the bird breeding season. The majority of the site was covered with lower vegetation which provided only a moderate hindrance if traverses were walked suitably slowly.

A low growth of blackthorn saplings on the rear of the eastern rampart had increased since the 2020 survey and caused some problem with walking accurate traverses in this area. For an area approximately equivalent to a single 20m grid, the 2020 survey appears of slightly better quality than the 2021 work because of this growth. This is shown in Figure 6 and a merged dataset in Figure 7 (which exhibits some very slight issues with edge matching).

A reduced area was accessible along the southern margin of the survey compared with 2020, because of a new fence in response to coastal erosion. The magnetic anomaly produced by the steel fencing obscures a further width of approximately 4m inside the present field.

The 2021 data were generally of a good quality over most of the site (Figures 2-5). The geophysical anomalies have a remarkably low amplitude (the archaeological features mostly have amplitudes of <2nT/m). There is therefore little separation of the anomalies produced by the buried archaeology and the background.

Interpretation

Lineations interpreted to be of geological origin

Two sets of anomalies are interpreted to be of geological origin.

One faint set of lineations are directed SSW-NNE. These are locally closely spaced in the SE sector of the survey. These closely resemble similar anomalies, interpreted as due to jointing, on other sites in the Llantwit Major area (e.g SSW-NNE at Moorlands, Young 2020b; SSW-NNE at Caermead, Young 2016; SSE-NNW at Llanmaes, Young 2010, SSE-NNW at Boverton, Young 2020a).

The second set of anomalies are individual features, typically broad (up to several metres), positive linear anomalies of a rather diffuse and variable nature. The precise interpretation of these is uncertain. They correspond in direction to geological features exposed on the wave-cut platform (Figure 14). They probably mostly represent fractures (i.e. faults) and the orientation of several parallel to the eastern defences is possibly because the location of those defences was determined by the topographic effects of similar structures. In addition to fractures, it is possible that some may have been produced by the 'step' produced by the eroded margin of individual limestone beds (as seen particularly on the western section of the wave-cut platform on Figure 14).

All of the features interpreted to be of geological origin are illustrated in grey tone on Figures 8 and 9.

Anomalies associated with medieval/post-medieval land-use

The clearest indications of former agricultural land use are the two features visible as earthworks in the modern landscape (Figure 10). The western, almost straight, example is represented by a negative anomaly, perhaps suggesting this feature is dominantly of stone. The eastern curvilinear feature shows a positive anomaly associated with its bank, suggesting this may be largely redeposited topsoil. The line of this feature suggest that it was constructed by enlarging one of the earlier cultivation ridges.

The LiDAR data shows narrow (5m spaced on average) ridge and furrow parallel to the eastern earthwork former field boundary, sweeping from NW-SE to be more coast-parallel near the cliff. This is represented in the magnetic survey by parallel zones of elevated magnetic gradient corresponding to the ridges within the SE sector of the survey (grey lines on Figure 10). This increased visibility in the SE is interpreted to be due to an increased amount of earlier occupation soils with enhanced magnetic susceptibility available for reworking into the ridges there. The intensity of the anomalies associated with the ridge and furrow can therefore be taken as a proxy indicator of the extent of the more intense Iron Age occupation.

In the NE sector of the survey the ridge and furrow reappears within the magnetic data but is imaged by parallel narrow negative anomalies. These are interpreted as indicating the location of the furrows, with a greatly reduced depth to bedrock producing the negative anomalies (purple lines on Figure 10).

Anomalies probably associated with earlier archaeological features

A series of discrete anomalies that do not appear to be either associated with the medieval/post-medieval land-use nor to be of geological origin are interpreted as being generated by pre-medieval archaeological cut features. These features are depicted in gold tone on Figures 8, 11 and 13.

These anomalies include multiple examples of arcuate narrow positive anomalies, some penannular, mostly with a range of +/-2nT. These have of a range of diameters (approximately 8m to 12m) compatible with identification as ring gullies from Iron Age or Romano-British roundhouses. Approximately 16 potential examples of roundhouses can be identified, mostly in a swathe parallel to the cliff top.

Numerous other smaller anomalies a range of +/-5nT are associated with the zone containing the ring ditches. These anomalies are likely to be associated with pits. They are centred at:

295974, 167400
296057, 167405
296054, 167391
296058, 167384
296082, 167401
296046, 167388
296066, 167373

A single example of these anomalies (centred at: 296018, 167411) is both larger (4m in diameter) and of higher amplitude (10nT). This may be either a larger pit with a fill of high magnetic susceptibility, or perhaps a hearth or similar structure.

Discussion

The new data provides convincing evidence for the survival of abundant features relating to occupation of the fort. The subsequent ridge and furrow ploughing shows more strongly in the magnetic survey in the area of the occupation evidence. On one hand this indicates disruption of the occupation-influenced deposits by the ploughing, but it also may indicate that occupation deposits may survive even outside the cut features below the plough ridges. This occupation was apparently concentrated in an area that is now less than 35m from the cliff-top fence.

The evidence for later cultivation is also important. It is conceivable that the minor late field boundaries correspond to the 17th record of enclosed land, Castle Close. The earlier ridge and furrow cultivation, if medieval, would have lain within the manorial demesne, despite the Colhuw property being usually described as woodland and meadow.

Comparison of the 1st Edition OS mapping of 1880 and the modern LiDAR survey, suggests cliff retreat over the last 140 years of approximately 22m near the current viewpoint on the path ascending from the beach, 14 m at the crest of the hill (probably resulting in the removal of all the evidence for the N-S rampart cutting across the promontory) and of 5-10m along the coastline cutting the interior and eastern defences.

Unless some very minor vestige of the cross-promontory rampart near the tip of the hill survives on the line of the modern footpath, then this may have been lost entirely. This rampart was suggested to be a vestige of an earlier smaller fort by RCAHMW (1976), but is certainly open to other interpretations.

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Figure Captions

Figure 1 Location of the survey area for the 2021 survey on OS Mastermap basemap (© Crown Copyright and Database Right 2021 Ordnance Survey (1000025252)). The extent of the surveyed area is indicated by the pecked line, with the inaccessible areas also outlined.

Figure 2. 2021 magnetic gradiometer data on OS Mastermap basemap (© Crown Copyright and Database Right 2021 Ordnance Survey (1000025252)).
Greyscale -1nT/m (black) to +1nT/m (white).

Figure 3. 2021 magnetic gradiometer data on OS Mastermap basemap (© Crown Copyright and Database Right 2021 Ordnance Survey (1000025252)).
Greyscale -2nT/m (black) to +2nT/m (white).

Figure 4. 2021 magnetic gradiometer data on OS Mastermap basemap (© Crown Copyright and Database Right 2021 Ordnance Survey (1000025252)).
Greyscale -4nT/m (black) to +4nT/m (white).

Figure 5. 2021 magnetic gradiometer data on OS Mastermap basemap (© Crown Copyright and Database Right 2021 Ordnance Survey (1000025252)).
Greyscale -8nT/m (black) to +8nT/m (white).

Figure 6. Extract from 2021 magnetic gradiometer data on OS Mastermap basemap (© Crown Copyright and Database Right 2021 Ordnance Survey (1000025252)).
Greyscale -2nT/m (black) to +2nT/m (white).

Figure 7. Montage of 2020 and 2021 magnetic gradiometer data on OS Mastermap basemap (© Crown Copyright and Database Right 2021 Ordnance Survey (1000025252)).
Greyscale -2nT/m (black) to +2nT/m (white).

Figure 8. Interpretation of data: all anomalies shown. These are shown separated into groups in the Figures 9 to 11. For further explanation see text and subsequent figures. Illustrated on OS Mastermap basemap (© Crown Copyright and Database Right 2021 Ordnance Survey (1000025252)).

Figure 9. Interpretation of data: anomalies interpreted as being produced by geological features. For further explanation see text and subsequent figures. Illustrated on OS Mastermap basemap (© Crown Copyright and Database Right 2021 Ordnance Survey (1000025252)).

Figure 10. Interpretation of data: anomalies interpreted as being produced medieval or post-medieval features. For further explanation see text and subsequent figures. Illustrated on OS Mastermap basemap (© Crown Copyright and Database Right 2021 Ordnance Survey (1000025252)).

Figure 11. Interpretation of data: anomalies interpreted as being produced by early archaeological (particularly Iron Age) features. For further explanation see text and subsequent figures. Illustrated on OS Mastermap basemap (© Crown Copyright and Database Right 2021 Ordnance Survey (1000025252)).

Figure 12. Image of 2m pixel LiDAR data, artificially illuminated from the SW.

Figure 13. As Figure 12 but with interpretation of possible Iron Age features superimposed.

Figure 14. As Figure 3, but with magnetic survey overlaid on a screenshot of Google Earth data from December 2001 to show wave-cut platform at low tide. (backdrop image © Copyright 2021, The Geoinformation Group)

Figure 1

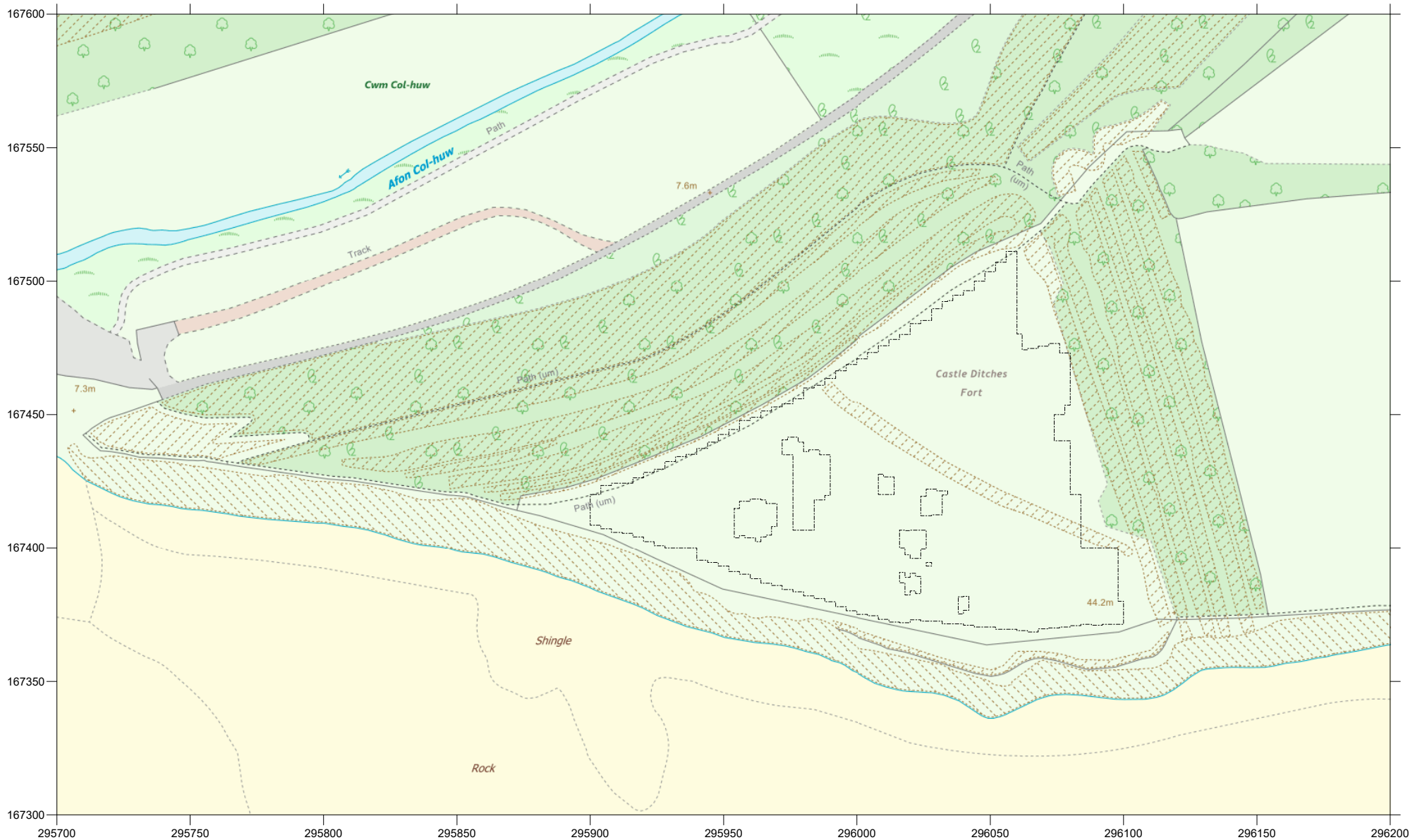

Figure 2

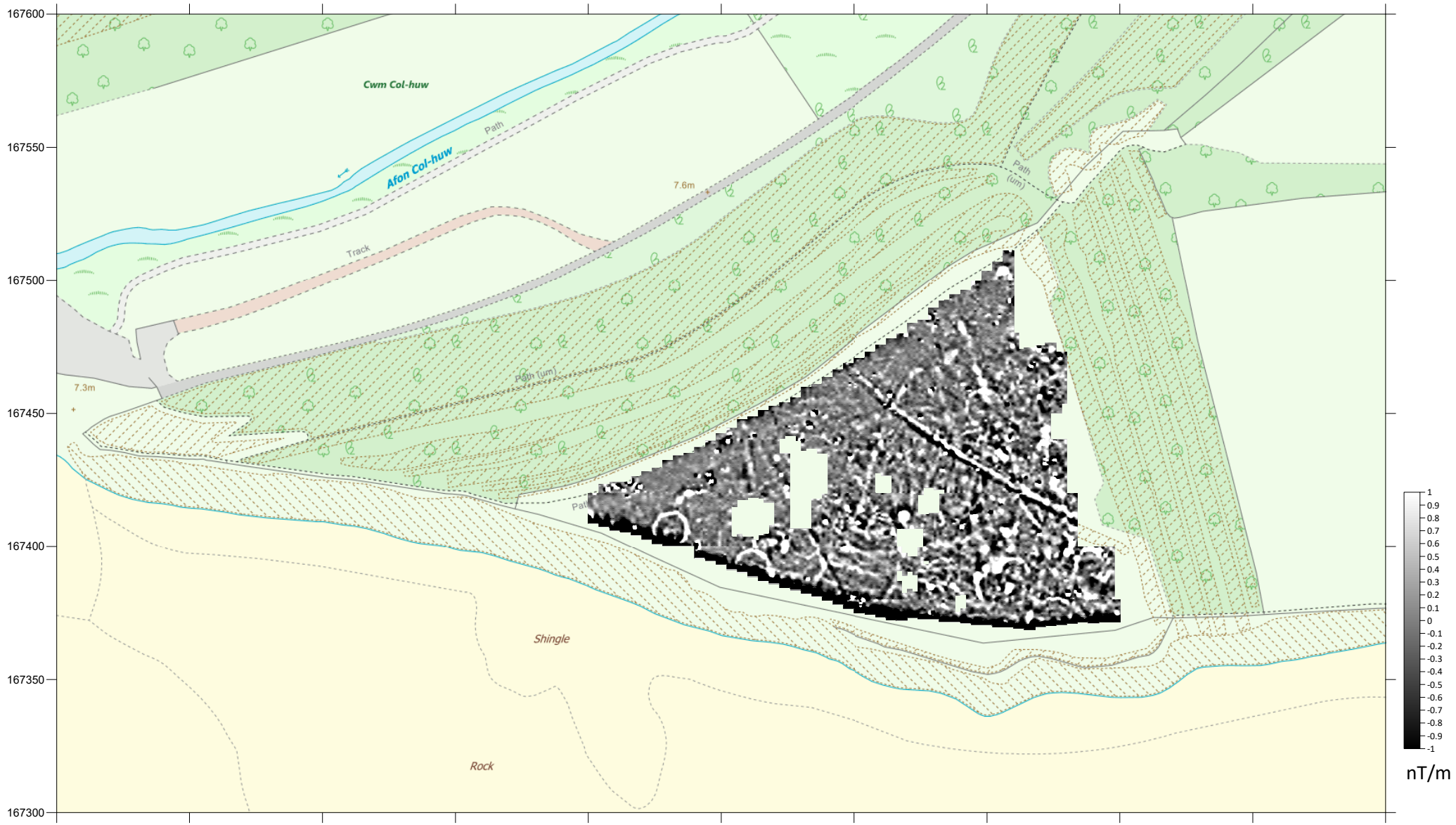

Figure 3

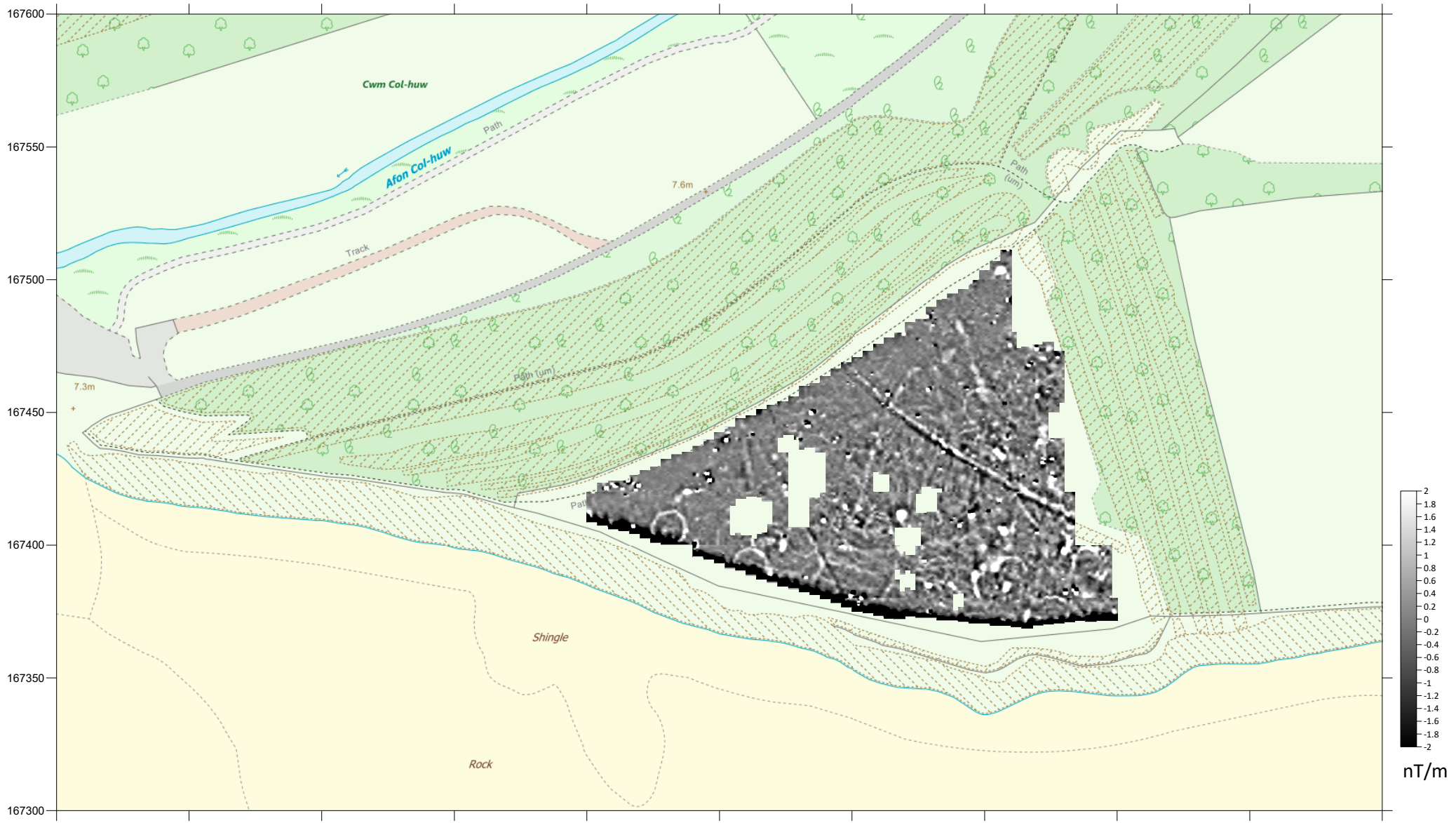

Figure 4

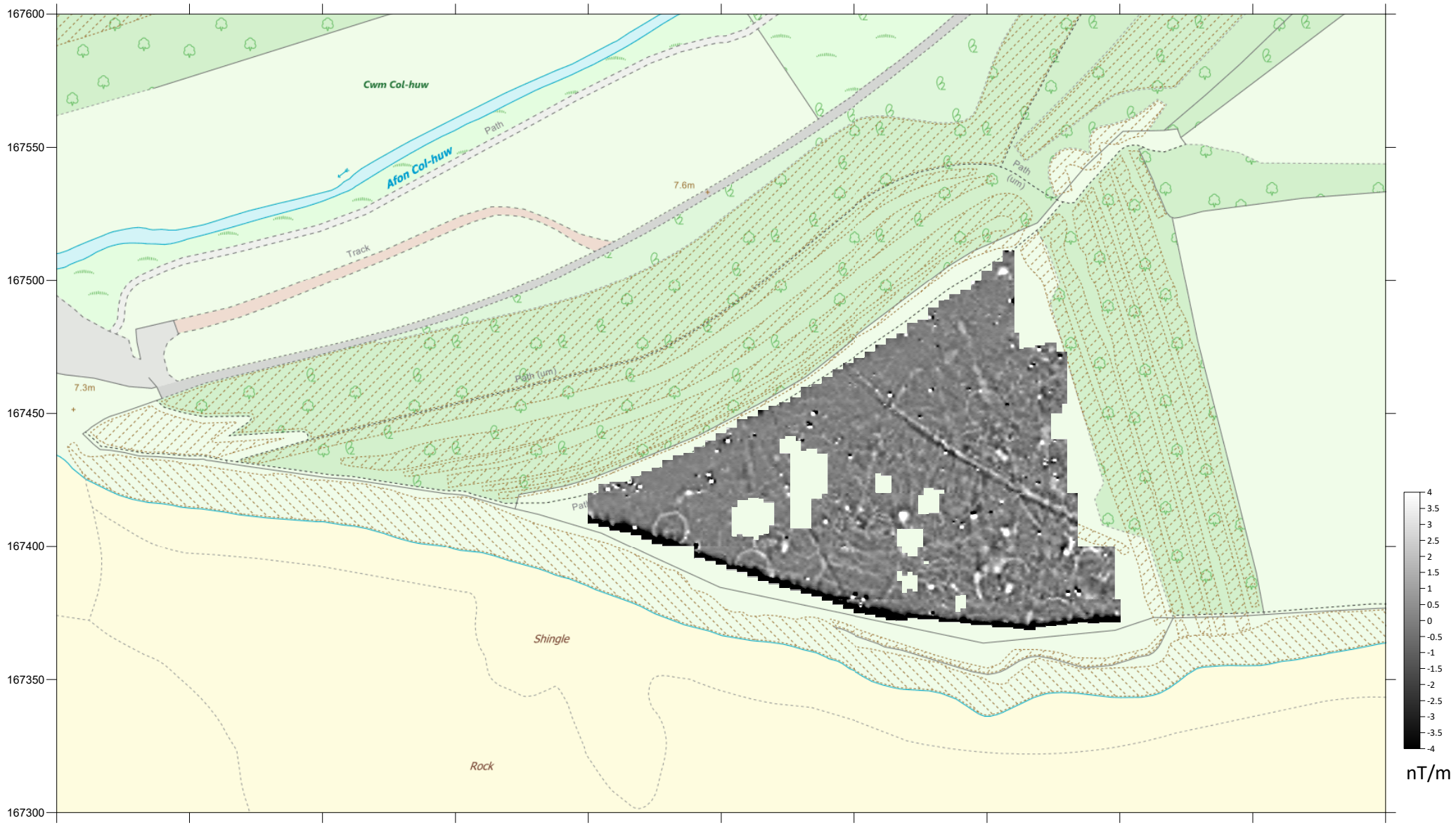

Figure 5

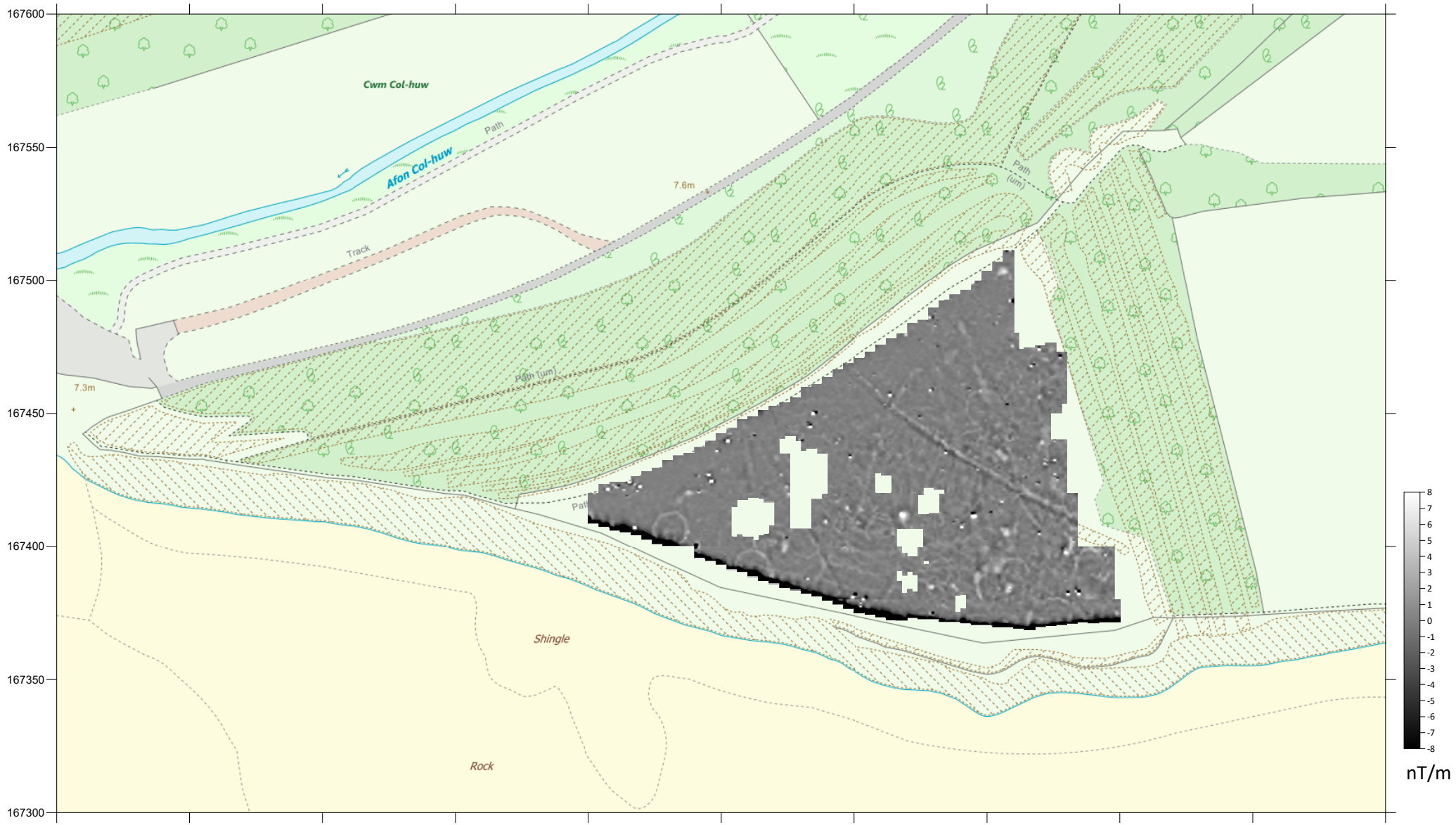

Figure 6

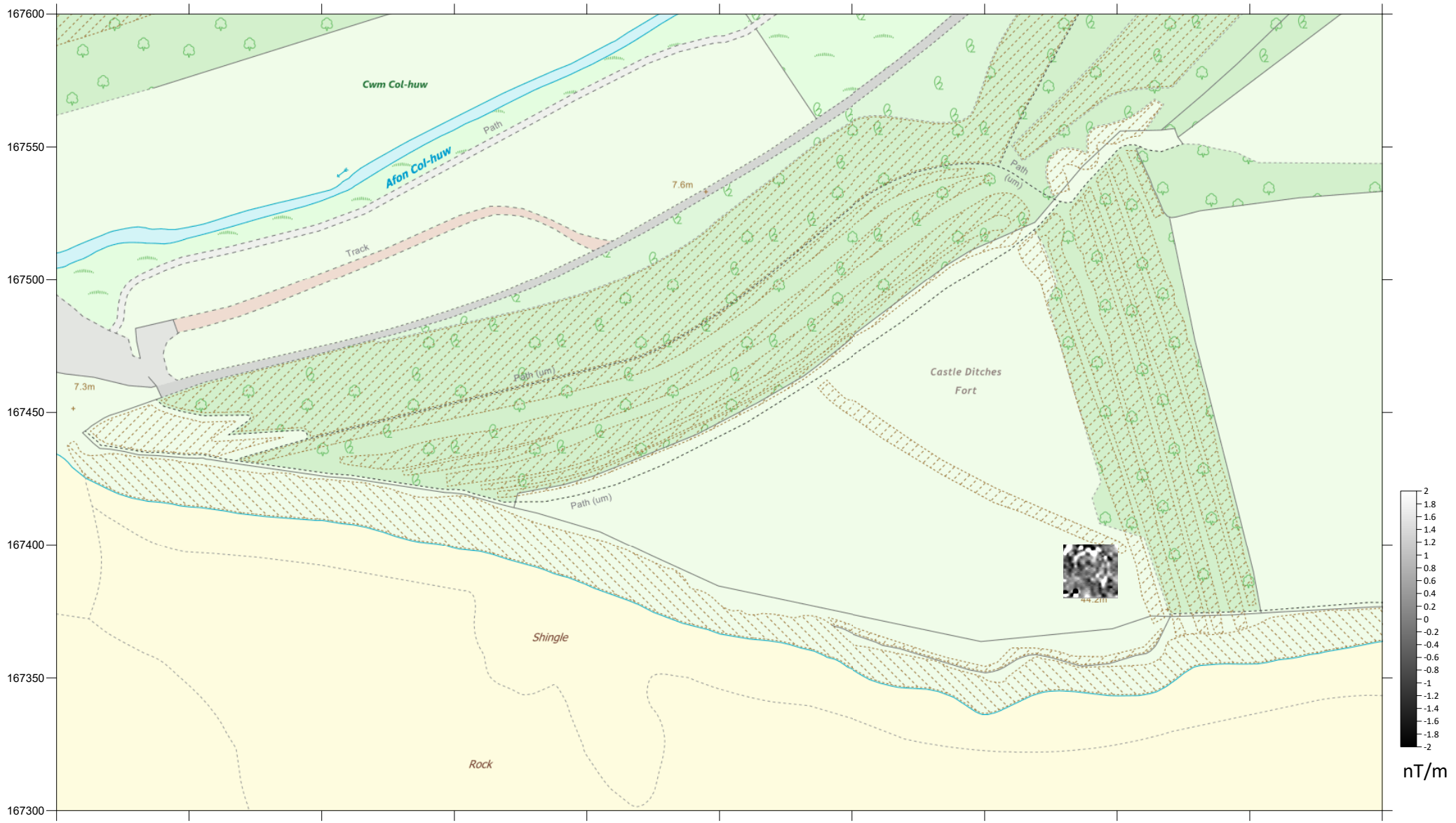

Figure 7

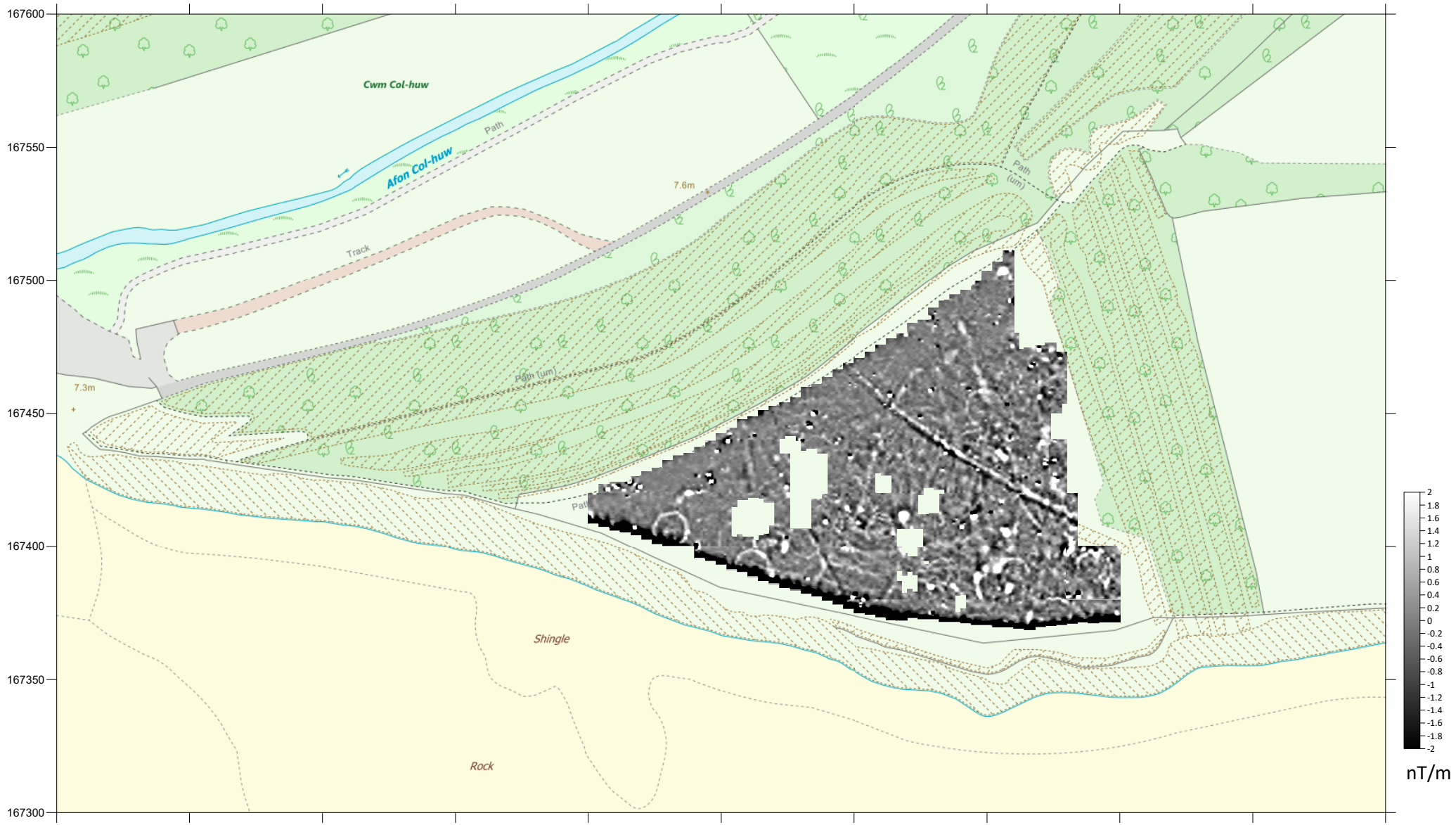

Figure 8

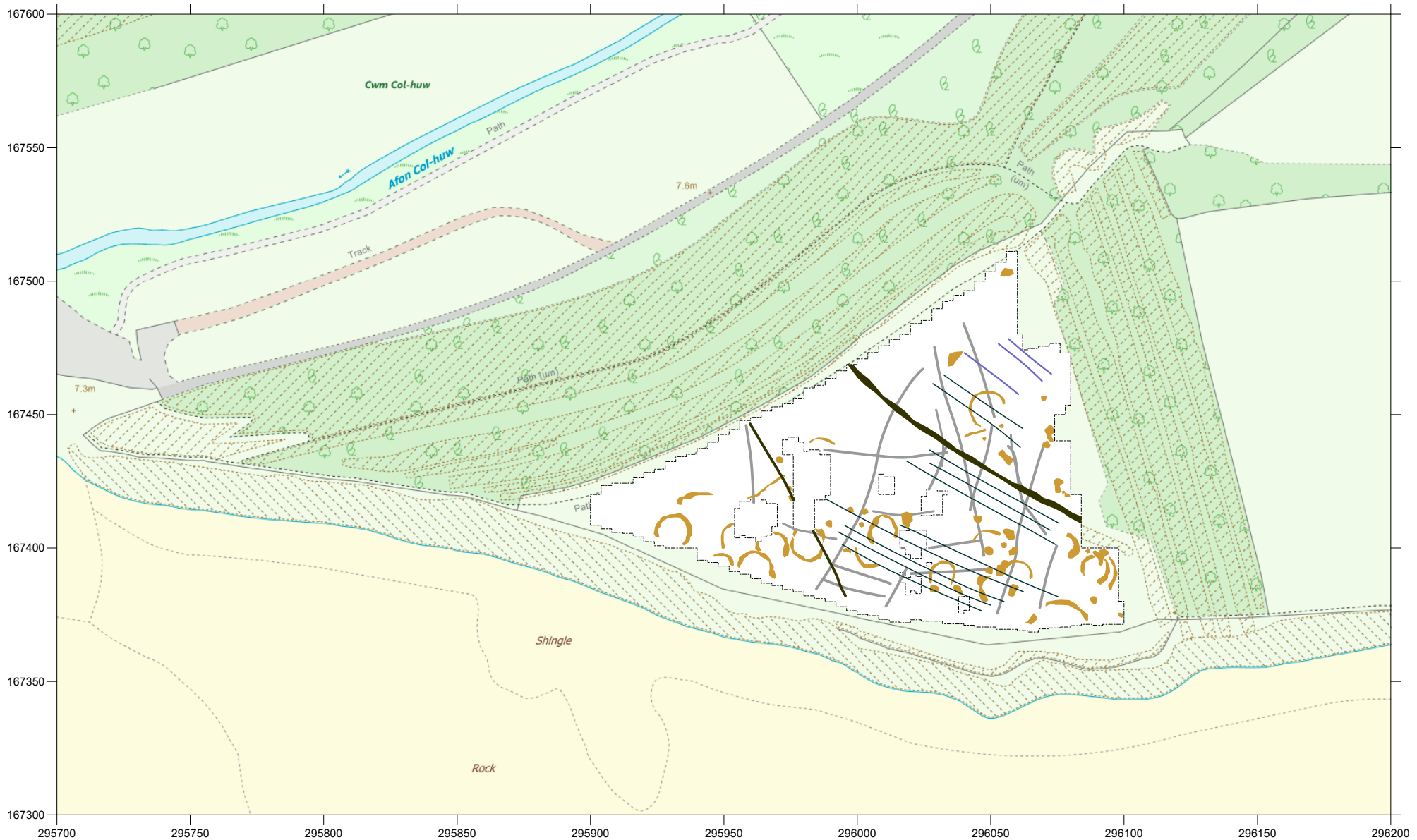

Figure 9

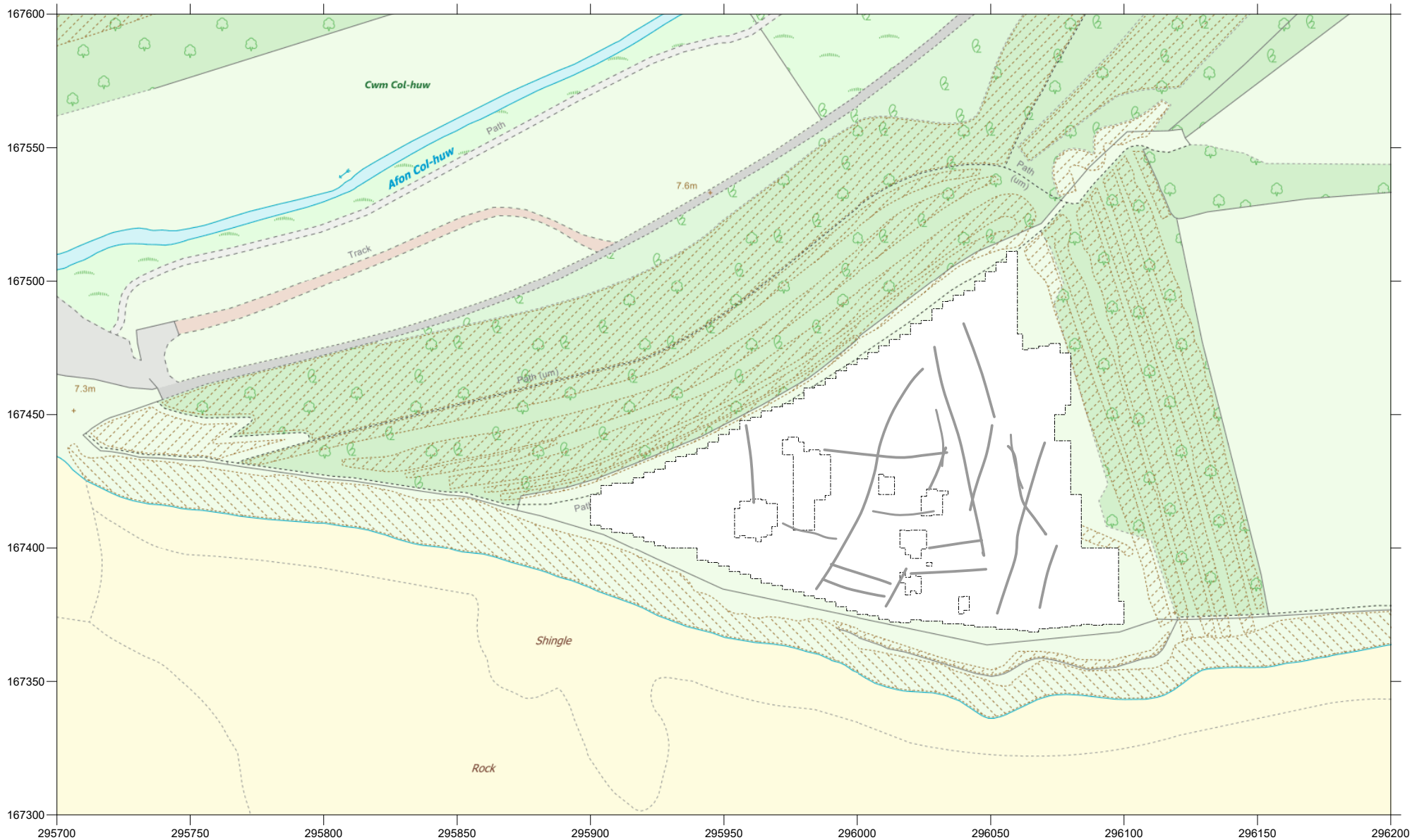

Figure 10

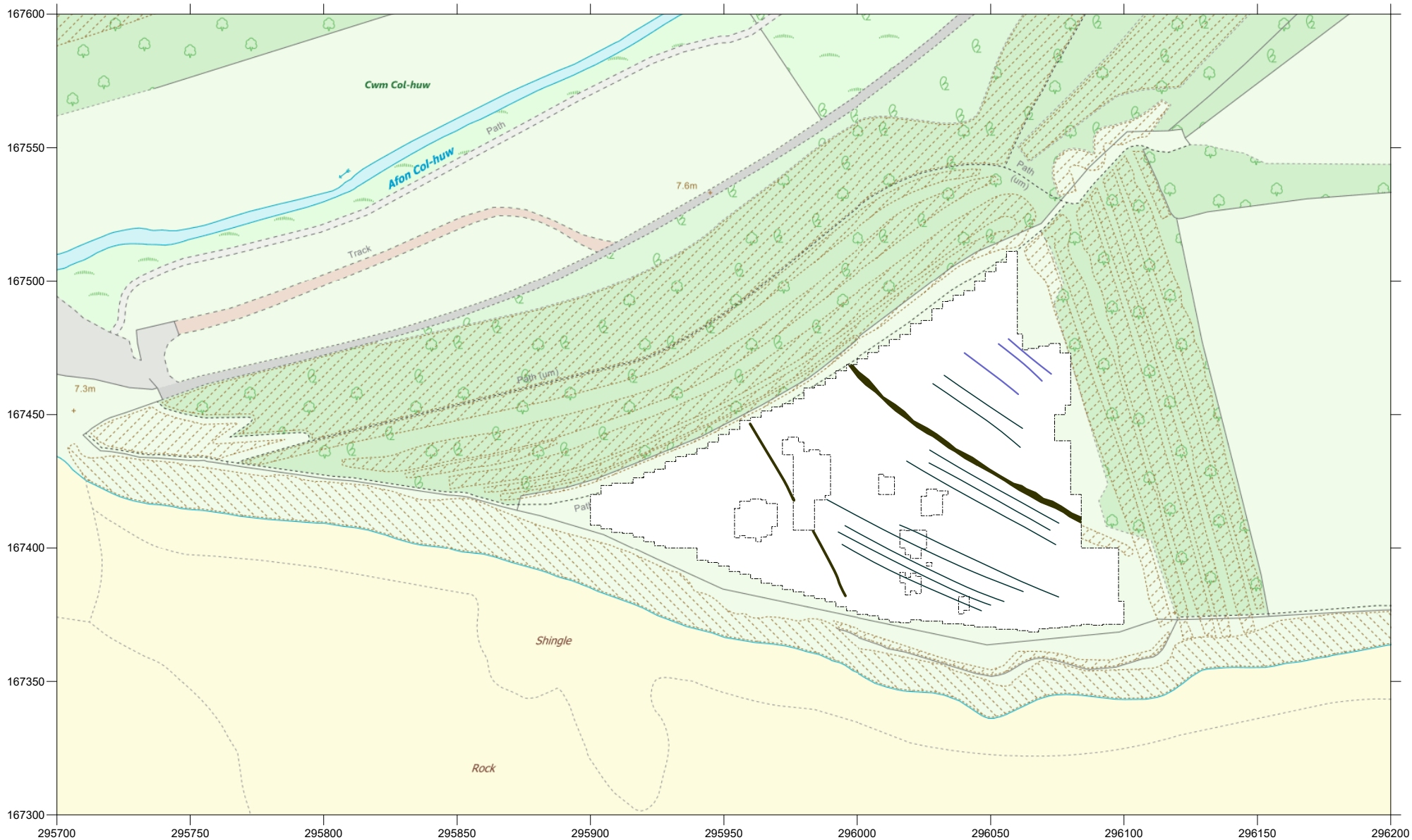

Figure 11

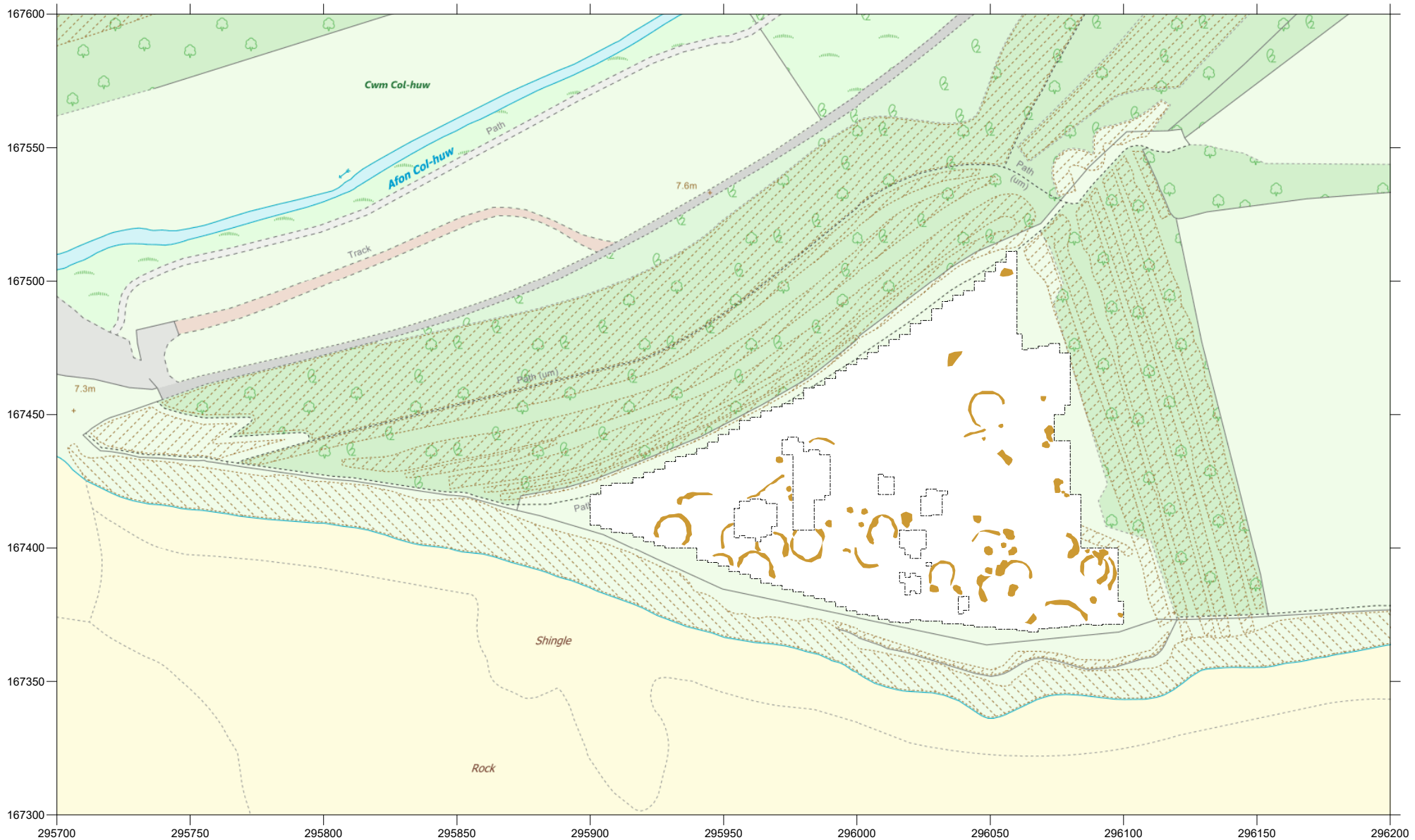

Figure 12

Figure 13

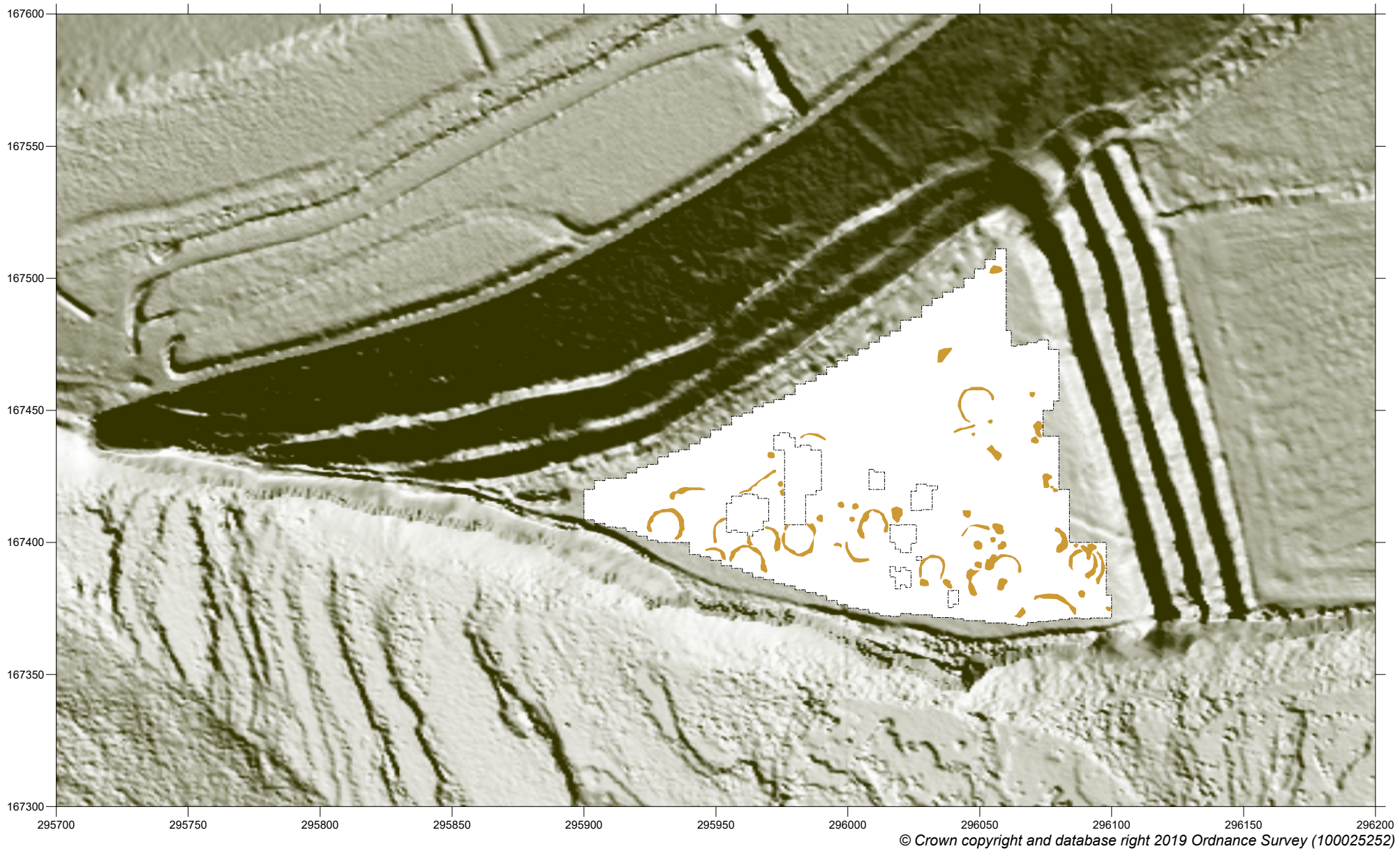


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Figure 14

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geoarchaeological, archaeometallurgical & geophysical investigations

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