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PERSIMMON HOMES (LANCASHIRE)

LAND AT THE FORMER CHEMICAL WORKS
WHITEHAVEN
CUMBRIA

GEOPHYSICAL SURVEY REPORT

JANUARY 2020

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PERSIMMON HOMES (LANCASHIRE)

Land at the Former Chemical Works, Whitehaven, Cumbria

Geophysical Survey Report

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SUMMARY

Wardell Armstrong LLP (WA) was commissioned by the client, Persimmon Homes (Lancashire) to undertake a geophysical survey at Land at the Former Chemical Works, Whitehaven, Cumbria (NGR: NX 96521 16525). The geophysical survey was required to support a forthcoming planning application to redevelop the site. The geophysical survey was undertaken in response to advice given by Jeremy Parsons acting as the archaeological planning advisor on behalf of Cumbria County Council. The objective of the geophysical survey was to determine the presence/absence, nature and extent of potential archaeological features within the study area and the presence/absence of any known modern features within the survey area, which may affect the results.

The survey was undertaken during December 2019 and comprised of three fields of arable farmland. The investigation revealed a possible rectangular enclosure in the south eastern portion of Area 1 which corresponds to potential prehistoric cropmarks (Asset 4, CCC HER 4669) (WA 2018) identified during a Heritage Impact Assessment. Furthermore, it was established that all areas had been heavily ploughed potentially disturbing ephemeral archaeological features. Area 3 contained a large amount of magnetic disturbance which is probably associated with the service that was identified and The Corkickle Wagonway (Asset 43) and The Barrowmouth wagonway (Asset 44).

ACKNOWLEDGEMENTS

Wardell Armstrong LLP (WA) thanks the client, Persimmon Homes (Lancashire) for commissioning the project, and for all their assistance throughout the work. Also, WA thank Jeremy Parsons, at Cumbria County Council for his assistance.

The geophysical survey was undertaken by Kevin Mounsey and Laura Caygill-Lowery and the report written by Mike Birtles who also prepared the illustrations. The project was managed by Damion Churchill who also edited the report.

1 INTRODUCTION

1.1 Project Circumstances and Planning Background

1.1.1 During December 2019, Wardell Armstrong LLP (WA) undertook a geophysical survey at Land at Former Chemical Works, Whitehaven, Cumbria (NGR: NX 96521 16525). It was commissioned by the Client, Persimmon Homes (Lancashire) to provide information to support a forthcoming planning application for redevelopment of the site.

1.1.2 The possible remains of an enclosure revealed by a geophysical survey to the east of the proposed development site (GSB 2014, 5) were proven to be of modern agricultural and geological origin during a subsequent archaeological evaluation (CFA 2014, 3). A Heritage Impact Assessment of the site carried out by WA (WA 2018) identified four designated heritage assets within the survey boundary.

1.1.3 The geophysical survey of Land at Former Chemical Works, Whitehaven was therefore commissioned in order to help determine the presence/absence, nature and extent of archaeological remains within the proposed development site.

1.2 Project Documentation

1.2.1 The project conforms to advice provided by Jeremy Parsons, Historic Environment Officer at Cumbria County Council.

1.2.2 This report outlines the results of the geophysical survey undertaken, and the interpretation of the geophysical survey results, in light of the historical and archaeological background of the site.

2 METHODOLOGY

2.1 Standards and guidance

2.1.1 The archaeological geophysical survey was undertaken following the Chartered Institute for Archaeologists *Standard and Guidance for an archaeological geophysical survey* (CIfA 2014), and Historic England (English Heritage 2008) guidelines.

2.2 Documentary Research

2.2.1 A Heritage Impact assessment was produced by WA to assess the known historical and archaeological background of the site and the surrounding landscape to a distance of 1km (WA 2018).

2.3 The Geophysical Survey

2.3.1 **Technique Selection:**

2.3.2 Geomagnetic survey was selected as the most appropriate technique, given the non-igneous environment and the expected presence of cut archaeological features at depths of no more than 1.5m. This technique involves the use of a hand-held gradiometer, which measure variations in the vertical component of the earth’s magnetic field. these variations can be due to the presence of sub-surface archaeological features.

2.3.3 Data was recorded by the instruments and downloaded into a laptop computer for initial data processing in the field using specialist software.

2.3.4 **Field Methods:**

2.3.5 Geomagnetic measurements were determined using a Bartington Grad 601-2 dual gradiometer system, with twin sensors set 1m apart. It was expected that significant archaeological features at a depth of up to 1.5m would be detected using this arrangement. The survey was undertaken using a zig-zag traverse scheme, with data being logged in 30m grid units. A sample interval of 0.25m was used, with a traverse interval of 1m, providing 3600 sample measurements per grid unit, with measurements being recorded at the centre of each grid cell.

2.3.6 **Data Processing:**

2.3.7 The data was downloaded on site into a laptop computer for processing and storage. Geophysical survey data was processed using Terrasurveyor software, which was used to produce ‘greyscale’ images of the raw data. Positive magnetic anomalies are displayed as dark grey, and negative magnetic anomalies are displayed as light grey. A palette bar shows the relationship between the grey shades and geomagnetic values in nano-tesla (nT) for each area.

2.3.8 Raw data was processed in order to further define and highlight the archaeological features detected. The following basic data processing functions were used:

- Destripe: to reduce the effect of striping in the gradiometer data, sometimes caused by the misalignment of the twin sensors (zero mean traverse was performed on all survey grids using a threshold of 2 standard deviations).
- Destagger: to reduce location inaccuracies in the gradiometer data, sometimes caused by operator error (destagger applied in y direction by 2 readings)
- Clip: to clip data to specified maximum and minimum values, in order to limit large noise spikes in the geophysical data (clipped from -7nT to 7nT).

2.3.9 **Interpretation:**

2.3.10 Five types of geophysical anomaly were detected in the gradiometer data:

- *Positive Magnetic*: regions of anomalously high or positive magnetic data, which may be associated with the presence of high magnetic susceptibility soil filled features, such as pit or ditches.
- *Positive / Negative Magnetic*: parallel trends of linear opposing magnetic anomalies typically associated with agricultural practices
- *Dipolar Magnetic*: regions of paired positive and negative magnetic anomalies, which typically reflect ferrous or fired materials, including fired/ferrous debris in the topsoil, or fired structures such as kilns or hearths.
- *Bipolar Magnetic*: typically linear regions of alternate positive and negative magnetic anomalies, which typically reflect buried service pipes or drains.
- *Magnetic Disturbance*: areas of high amplitude magnetic disturbance or interference, which may be associated with the presence of modern structures, such as services, fences or buildings.

2.3.11 **Presentation:**

2.3.12 The greyscale images were combined with site survey and Ordnance Survey (OS) data to produce the geophysical survey figures used in the report. Colour-coded geophysical interpretation diagrams are provided for each area in the report, showing the locations and extent of the magnetic anomalies. Archaeological interpretation diagrams are also provided, which are based on the interpretation of the geophysical survey results, in light of the archaeological and historical context of the site.

2.3.13 **Archive:**

2.3.14 A full professional archive has been compiled in accordance with the project specification, and the Archaeological Data Service recommendations (ADS 2013). The archive comprises a compressed (zipped) file folder, containing the geophysics data, documentation (metadata), and other project material (report and field notes). Copies of the report will be sent to the Cumbria HER, available upon request.

2.3.15 Wardell Armstrong LLP supports the **O**nline **A**cces**S** to the Index of Archaeological **I**nvestigation**S** (OASIS) project. This project aims to provide an on-line index and access to the extensive and expanding body of grey literature, created as a result of developer-funded archaeological work. As a result, details of the results of this project will be made available by WA as a part of this national scheme. The OASIS reference for the project is: wardella2- 382452.

3 BACKGROUND

3.1 Location and Geological Context

3.1.1 The site is located centred at (NX 96521 16525). The site's environs comprise arable farmland to the north, residential area to the east, heathland to the south and the Irish Sea to the west. The site is located approximately 2km southwest of Whitehaven, Cumbria. The area of investigation lies at a height of c.80m aOD (above Ordnance Datum) with the ground sloping down steeply to the west.

3.1.2 The site is approximately 11 hectares in size and is made up of two rectangular fields and one triangular field. At present the site comprises arable farmland.

3.1.3 The underlying solid geology within the area of investigation is mapped as Whitehaven Sandstone Formation of the Sandstone Sedimentary bedrock formed between 315.2 and 308 million years ago during the Carboniferous period. This is overlain by superficial deposits of Devensian Till, a sedimentary deposit formed between 116 and 11.8 thousand years ago during the Quaternary period. (BGS 2020).

3.2 Historical and Archaeological Background

3.2.1 A Heritage Impact assessment was produced to assess the known historical and archaeological background of the site and the surrounding landscape to a distance of 1km (WA 2018). It is not intended to repeat that information here and what follows is a brief overview, for further details please refer to the original document.

3.2.2 This report identified that there were four designated heritage assets within the site geophysical survey boundary.

Asset Number	Reference	Site Name	Description
4	CCC HER 4669	Crop mark	Rectilinear Cropmark
30	First Ed OS	Rifle Range	Site of 'Rifle Range' shown on First Edition OS map and subsequent maps but gone by 1957
42	Cranstone Consultants and Ironbridge Archaeology 2007, 46; First Ed OS map	Croft Incline	Constructed in 1828 from beside Ravenhill Pit to Croft Pit, serving Kells Pit halfway along its route. It was a gravity incline on a long and gentle ascent, and was provided with a small engine house to assist in hauling back the empty waggons

43	Cranstone Consultants and Ironbridge Archaeology 2007, 44; Second Edition OS map	Corkickle wagonway	Site of an 1890s wagonway, seen on the Second Edition OS map, constructed from Croft Pit to the Furness Railway at Corkickle, comprising a railway and incline known as the Corkickle Incline. This fell into disuse after the closure of the Ladysmith Pit in 1931
44	Cranstone Consultants and Ironbridge Archaeology 2007; Second Edition OS map	Barrowmouth wagonway	By 1896 a wagonway had been constructed to connect the Alabaster Mine (Asset 1) to the Croft Incline (Asset 47), with links to the Alabaster/Cement Factory (Asset 36)

3.2.3 **Prehistoric**: at least two, and perhaps three, axes of the Neolithic period have been recovered from the study area. In a wider area, St Bees Head has been subjected to extensive field-walking surveys which have revealed a '*major cluster of later Mesolithic flint scatters*' (Cranstone Consultants and Ironbridge Archaeology 2007, 13), evidence of activity that continued into the Neolithic period, and it is possible that such activity extends to within the study area.

3.2.4 **Roman**: there is no definitive evidence for activity in the study area during the Roman period. A rectilinear cropmark is known from within the proposed development site, which may represent the remains of a settlement of Roman or earlier origin. Further evidence may come from the field name '*Castlerigg*' for a field to the north, which has been suggested to represent the site of a Roman fort (Cranstone Consultants and Ironbridge Archaeology 2007, 14).

3.2.5 **Medieval**: the parish of Sandwith was held by St Bees Priory until the dissolution, and the present layout of the village is indicative of a medieval settlement. The proposed development site lies beyond the reaches of the village and associated field system, and the Sandwith Tithe Award map of 1838 (CACW YDX 304/34) appears to show that the land to the north of Cabbage Hall had been carved out of an earlier landholding and may have formed a separate small estate. Much of the proposed development site lay within Preston Quarter, however, a separate parish to the north-east, which was part of the former St Bees holding 'Priest's-ton', but owned by the Lowther family from 1630. In the mid 18th century, the head Lowther, then the Earl of Lonsdale, held the great tithes, as rector of St Bees, explaining why so little of the parish is depicted on the Preston Quarter Tithe Award map of 1846, including the proposed development site (CACC DRC/8/157). There are suggestions that there may be a lost hamlet of Preston, and the possibility that this lies somewhere in the vicinity of the proposed development site cannot be ruled out (Cranstone Consultants and Ironbridge Archaeology 2007, 20). Preston Quarter and Sandwith both formed poor law townships within the parish of St Bees (*ibid*, 18). Parish boundaries, one of which lies close to the proposed development site, are assumed to have remained consistent from the early Middle Ages.

3.2.6 There is extensive evidence for quarrying in the study area and it is possible that some of this began in the medieval period; Aikbank Quarry is shown on the Sandwith Tithe Award map of 1838 (CACW YDX 304/34). The proposed development site, and much of the wider study area, has been subjected to extensive post medieval and modern extractive and agricultural processes which may have obscured earlier activity.

3.2.7 **Post-medieval**: upon receipt of the St Bees/Whitehaven estate in 1630, Christopher Lowther actively sought the development of the harbour at Whitehaven to transport coal and salt. Mining, as well as salt making, is known to have occurred prior to the Lowthers, with references to it occurring in St Bees Parish in the 16th century (Cranstone Consultants and Ironbridge Archaeology 2007, 18). Christopher Lowther was exporting coal to Ireland in 1632, which suggests he must have exploited pre-existing mines. More extensive exploitation schemes were undertaken under Sir John Lowther from the 1660s. The earliest pit known from the present study area is Greenbank Pit, operated by 18 men in 1675, and placed within the study area on placename evidence. Other constituents of the 18th century Greenbank Colliery development were Moss Pit and Fox Pit, sunk by 1709, and perhaps as early as 1693, both also within the study area. Other, slightly later 18th century pits, sunk under the auspices of Carlisle Spedding in the vicinity, include Kells Pit, sunk in 1750 and Wilson Pit, to the east of the proposed development area, which was sunk prior to 1779 (Cranstone Consultants and Ironbridge Archaeology 2007, 33).

3.2.8 Croft Pit, which was established within the proposed development site in 1774 along with the other more westerly pits in the Whitehaven coalfield, including Kells) and Wilson, had greater longevity than the more easterly ones, continuing to be worked in the late 19th, and sometimes 20th centuries (Cranstone Consultants and Ironbridge Archaeology 2007, 32). By 1781, Croft Pit had been connected to a wider waggonway system, known as the Saltom waggonway, this section becoming known as the Croft waggonway, possibly that shown on Greenwood's plan of 1823 leading to Wilson Pit. Croft Pit and Kells Pit (annotated 'Kills Pit') are also shown on Greenwood's map. An earlier waggonway seems to have run eastwards across the proposed development site to run across the Woodhouse Estate (Cranstone Consultants and Ironbridge Archaeology 2007, 44). The Croft waggonway was perhaps the scene of at least one early locomotive trial, in 1816, and also carried water pipes, though in 1828, it was replaced by the croft incline, which was served by an engine. Winding engines were introduced to Kells, Croft and Wilson Pits in the early 19th century, and Croft Pit was deepened in 1818 (Cranstone Consultants and Ironbridge Archaeology 2007, 35).

3.2.9 An additional waggonway was installed in the 1890s when a railway and incline was constructed linking Croft Pit to the Furness Railway at Corkickle. This is shown on the Second Edition Ordnance Survey map of 1899 to the east of the earlier Croft Incline with engine house. Further similar developments in the vicinity occurred with the provision of a waggonway to link the Barrowmouth Gypsum Mine into the waggonway at the top of the Croft Incline, with links to an associated Cement Works/ Alabaster Factory.

3.2.10 The Barrowmouth Gypsum Mine was another important extractive process occurring within the study area. The earliest mention of the discovery of alabaster seems to be in 1682 in a '*quarry at Sandwith Baurgh*' with a letter of 1698 noting the discovery of marble and possible future exploitation (Cranstone Consultants and Ironbridge Archaeology 2007, 47). Sandwith Baurgh, also referred to as Caput Bay in the 17th century, is marked on the Sandwith Tithe Award Plan of 1838 and lies to the west of the proposed development site. The earliest known reference to quarrying is in 1739 (CACW YDS 60/2/6/1), and by 1811, leases indicate that it had extended below ground, with a requirement for pillars to support the roof (CACW YDS 60/2/6/9). The Hamilton family took on the lease in *c*. 1844, renaming the area 'Port Hamilton' and constructing '*paths, ponds, a mock harbour and a lake… pleasure grounds with alabaster statues, a model castle and a small managerie*' (Cranstone Consultants and Ironbridge Archaeology 2007, 49).

3.2.11 The Barrowmouth Gypsum Mine was another important extractive process occurring within the study area. The earliest mention of the discovery of alabaster seems to be in 1682 in a '*quarry at Sandwith Baurgh*' with a letter of 1698 noting the discovery of marble and possible future exploitation (Cranstone Consultants and Ironbridge

Archaeology 2007, 47). Sandwith Baurgh, also referred to as Caput Bay in the 17th century, is marked on the Sandwith Tithe Award Plan of 1838 and lies to the west of the proposed development site. The earliest known reference to quarrying is in 1739 (CACW YDS 60/2/6/1), and by 1811, leases indicate that it had extended below ground, with a requirement for pillars to support the roof (CACW YDS 60/2/6/9). The Hamilton family took on the lease in *c*. 1844, renaming the area 'Port Hamilton' and constructing '*paths, ponds, a mock harbour and a lake… pleasure grounds with alabaster statues, a model castle and a small managerie*' (Cranstone Consultants and Ironbridge Archaeology 2007, 49). Hodgson, who worked as a plasterer after 1850, stated that this '*castle*' served teas and that the area was accessed from Barrowmouth farm by a '*difficult*' cart road, and that the main house comprised a two-storey building with Mr Hamilton's holiday flat at first floor level, a workmen's lodging below, and with the castle and museum beneath that (*ibid*). This operation seems to have ceased at some time between 1863 and 1888 when John Thomlinson of the Joseph Robinson Company leased the mining sett.

3.2.12 Other industrial developments in the wider study area include a smithy, a firebrick works, a tile works, reservoirs a brickfield and trackway, together representing the general increase in activity and occupation during the later post medieval period, futher represented by the establishment of a workhouse in the vicinity. The threat of war with France in the mid 19th century led to a countrywide increase in volunteer rifle corps, and the provision of rifle ranges to practice shooting skills (Out of Oblivion 2018). This may explain the existence of a rifle range in the north-western part of the proposed development site, illustrated on the First Edition Ordnance Survey map of 1865 and shown on subsequent mapping until the 1950s.

3.2.13 Despite these post medieval industrial developments, agriculture remained dominant into the 20th century (Cranstone Consultants and Ironbridge Archaeology 2007, 50). The landscape in the vicinity of the proposed development site, until the 20th century, retained the medieval division between the Preston Quarter and Sandwith townships and field systems around the villages of Sandwith and Arrowthwaite. However, the landscape within Preston Quarter township was massively reorganised, perhaps as a result of the Croft Incline in 1828, leading to a divergence in character between the area historically within Sandwith and that within Preston Quarter. For the proposed development site itself, this has little relevance, due to the massive changes brought about in the 20th century, but it does mean that the area to the south of the proposed development site, historically within Sandwith, has a higher potential to retain pre-

1828 archaeological deposits.

3.2.14 No previous known archaeological works have been undertaken within the development area

4 GEOPHYSICAL SURVEY RESULTS

4.1 Introduction

4.1.1 The geophysical survey was undertaken between the 12th and 17th December 2019. The geophysical survey covered the northern half of the area associated with the proposed redevelopment. The southern half of the proposed development site comprised land previously occupied by the former chemical works and was therefore unsuitable for geophysical survey.

4.1.2 The survey area was divided into three areas (Figure 2).

4.1.3 The results of the geophysical survey are depicted in Figures 3 to 12, with geophysics anomalies classified by type. Potential archaeological features are discussed below, with Historic Environment Record (HER) references given, where known (Figure 13).

4.2 Results

4.2.1 **Area 1 (Figures 3,4,7,8,11,12 and 13)**

4.2.2 Area 1 was located within the southern portion of the survey area and is roughly rectangular in shape. Cliffs bounded Area 1 to the west descending to the Irish Sea, a wire fence surrounded the area with Area 2 located immediately to the north. The coastal path bound this area to the east.

4.2.3 Intensive agricultural activity such as ploughing was evident extensively across the survey area on an east to west alignment (Figure 11). A heavily disturbed rectangular positive magnetic feature **1** was observed in the southwest corner in the vicinity of Heritage Asset 4 which may be significant and representative of a soil filled rectangular enclosure ditch (Figure 13).

4.2.4 A subcircular anomaly **2** observed within the enclosure **1** (Figures 7,8 and 12) was observed on the ground during survey, the geophysical data suggests that it is representative of a cut feature however the irregular magnetic signature suggests that it might be a collapsed pit shaft or quarry backfilled with clinker or industrial residue.

4.2.5 Further positive magnetic linear features were present which are typical of soil filled cut features such as ditches. These anomalies have been grouped by their linear properties, anomalies **3** are regular linear trends on a north to south alignment and are probably agricultural in origin. Anomalies **4** tend to be more irregular in nature and may represent archaeological soil filled features. Linear trend **6** located towards the southern limit of Area 1 respects the southern boundary and may represent a deeper plough furrow, boundary or former track.

4.2.6 Towards the northern extent of Area 1 positive magnetic discrete anomaly **7** is likely indicative of a pit and of possible archaeological origin.

4.2.7 A dipolar response indicating the metalled surface of a trackway **8** is observed traversing inside the eastern boundaries of Areas 1 and 2.

4.2.8 Based on the presence of possible soil filled features, in particular anomaly **1** which could be associated with Heritage asset 4, the archaeological potential for Area 1 is considered high.

4.2.9 **Area 2 (Figures 5,9,11,12 and 13)**

4.2.10 Area 2 was roughly square in shape and located within the northern portion of the survey area bound by wire fence with cliffs descending into the Irish Sea along the western boundary. Area 1 was located immediately to the south. The coastal path bound this area to the east.

4.2.11 Area 2 also contained anomalies **4** as discussed in Area 1. In addition, were wide positive magnetic linear trends of moderate amplitude **5** located in the northern half of Area 2, these features are visible on aerial imagery (Google maps, 2020) and are possibly indicative of fluvial activity such as paleochannels however an archaeological origin should not be disregarded.

4.2.12 A positive magnetic discrete response **7** is likely indicative of a pit and of possible archaeological origin.

4.2.13 A modern service 9 traverses inside the eastern boundary of the northern half of Area2

4.2.14 There are fewer possible archaeological features in Area 2 however the proximity to Heritage Asset 4 within Area 1 suggests that the archaeological potential in this area is considered medium.

4.2.15 **Area 3 (Figures 6,10,11,12 and 13)**

4.2.16 Area 3 was triangular in shape tapering to the south and located east of Areas 1 and 2. Area 3 was bounded by the coastal path to the west and a minor road to the east.

4.2.17 Area 3 was heavily disturbed by thermo-remnant debris **10** likely associated with the Corkickle and Barrowmouth wagonways (Heritage Assets 42 and 43), the geomagnetic noise created by this overburden would hinder detection of archaeological features below.

4.2.18 The presence of a modern service **9** running north-northwest to south -southeast through Area 3 however suggests the archaeological potential is considered low.

5 CONCLUSIONS

5.1 Interpretation

5.1.1 The geophysical survey surveyed the northern area associated with the proposed redevelopment. The southern area was excluded due to the former occupation of the chemical works rendering the area unsuitable for geophysical survey. The purpose of the survey was to determine the presence/absence nature and extent of potential archaeological features within the within the study area, and to identify the presence/absence of any known modern features within the survey area, which may affect the results.

5.1.2 The geomagnetic anomalies with archaeological potential identified were concentrated in Area 1. The remains primarily comprised positive magnetic linear responses likely associated with soil filled cut features.

5.1.3 The anomalies detected are indicative of past activity on the site potentially dating to the late prehistoric or Romano British period, heavily disturbed linear positive magnetic features appear to represent a rectilinear enclosure also identified as cropmarks (Asset 4, CCC HER 4669).

5.1.4 There is no evidence of the Rifle range (Asset 30) within the geophysical data.

5.1.5 In Areas 2 and 3, the geophysical survey indicated the survival of the archaeological features to be poor. Survival of potential archaeological features is potentially influenced by previous ploughing in Areas 1 and 2 and the presence of a modern service extending along the length of Area 3. Furthermore, any surviving archaeological features are likely to have been impacted by the former mining activity associated by the wagonways associated with the former Corkickle (Asset 43) and Barrowmouth (Asset 44) wagonways

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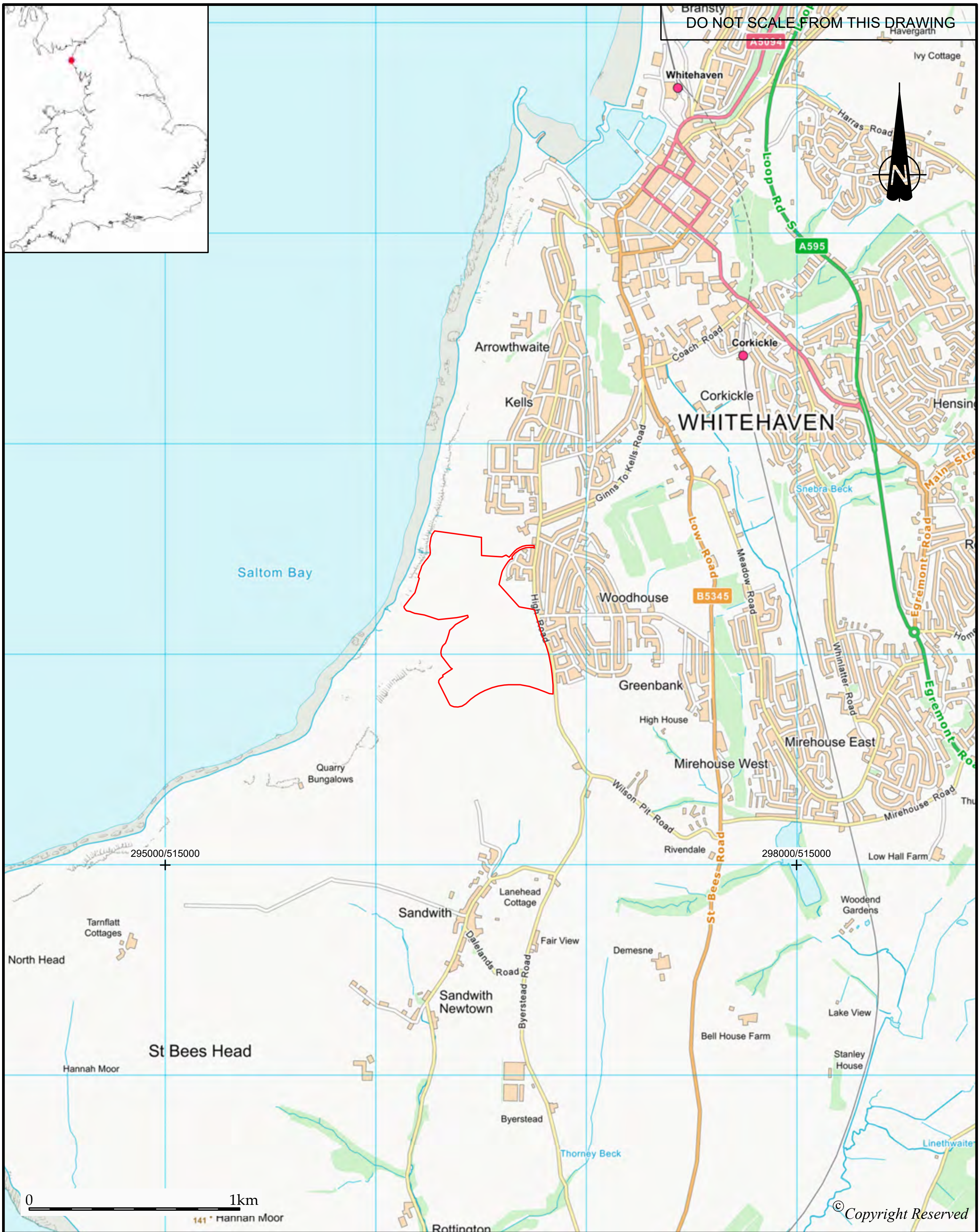
APPENDIX 1: FIGURES



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PROJECT Land at the Former Chemical Works, Whitehaven, Cumbria	SIZE A4	SCALE 1:25,000
	DATE Jan 2020	DRAWN BY MB
	CHECKED BY DAC	APPROVED BY FG
DRAWING TITLE Figure 1: Site location	wardell armstrong	

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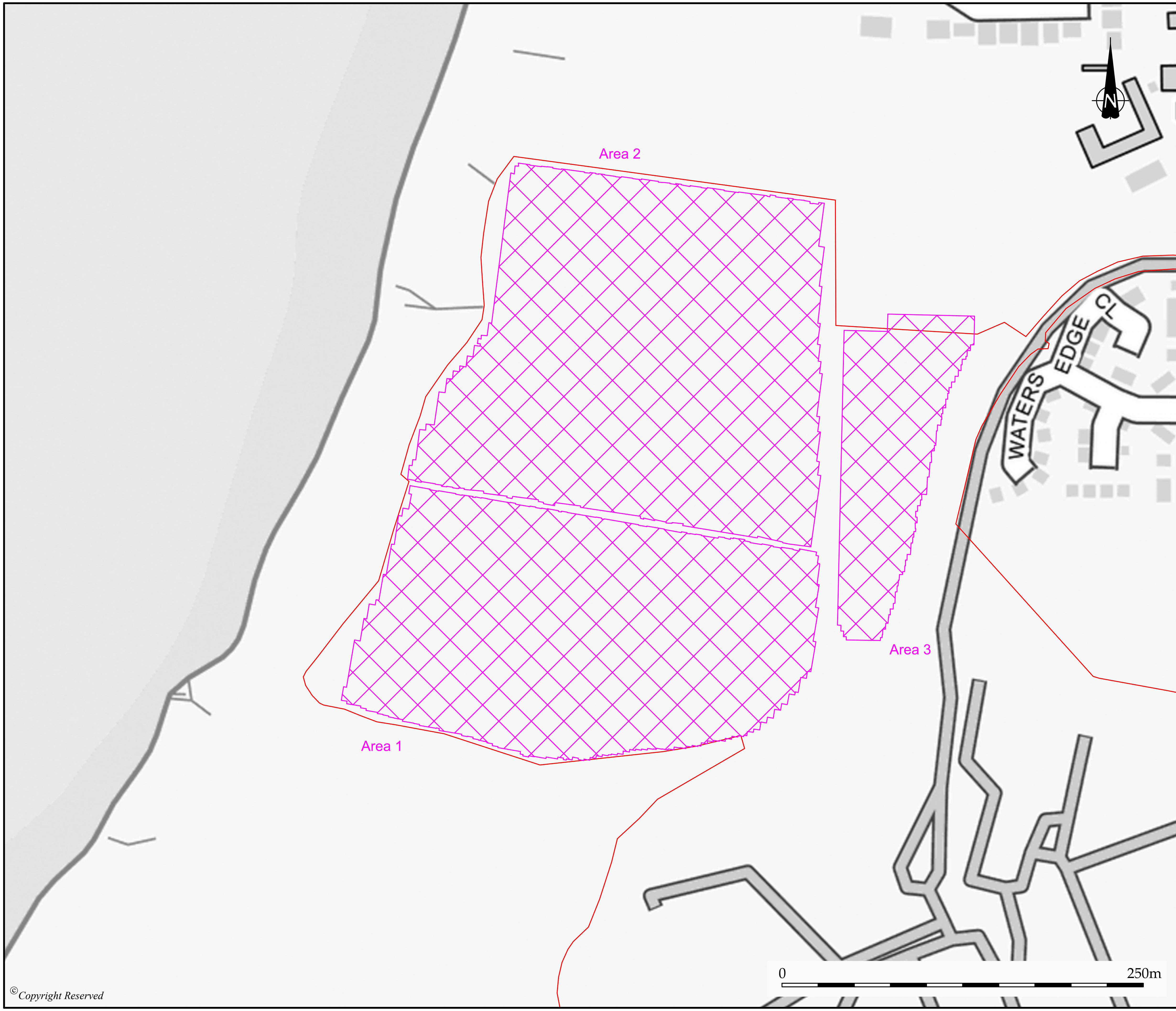

DO NOT SCALE FROM THIS DRAWING

KEY:

Site boundary

Geophysical Survey Area

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT
Persimmon Homes (Lancashire)

PROJECT
Land at the Former Chemical Works, Whitehaven, Cumbria

DRAWING TITLE
Figure 2:
Location of
Geophysical Survey Areas

DRG No.	REV
CL12200-102	A

DRG SIZE	SCALE	DATE
A3	1:2,500	Jan 2020
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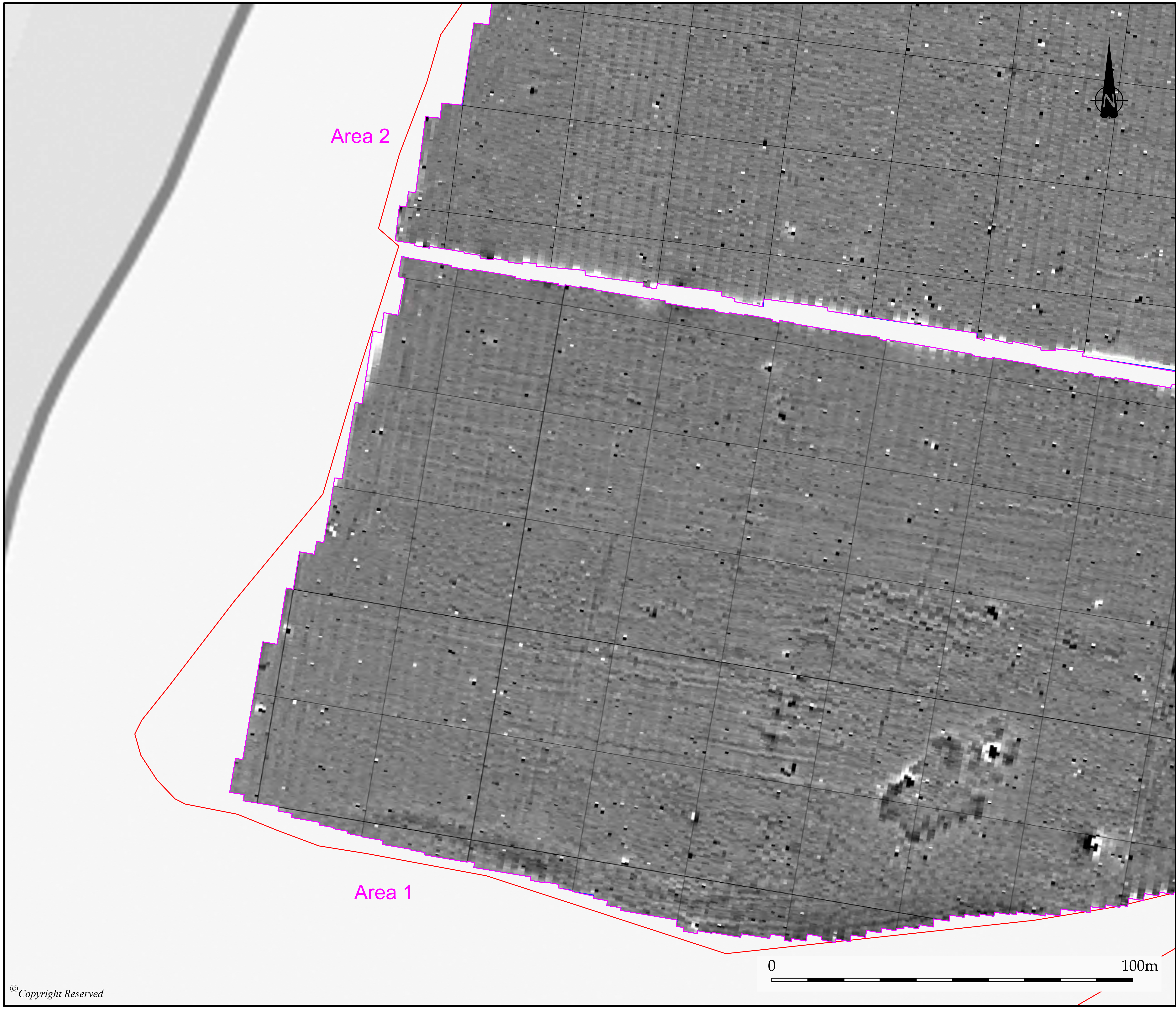

DO NOT SCALE FROM THIS DRAWING

KEY:

Site boundary

Geophysical survey area

REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

Persimmon Homes (Lancashire)

PROJECT

Land at the Former Chemical Works, Whitehaven, Cumbria

DRAWING TITLE

Figure 3: Geophysical Survey of Area 1 West (Raw data showing survey grid)

DRG No.	REV
CL12200-103	A

DRG SIZE	SCALE	DATE
A3	1:1000	Jan 2020

DRAWN BY	CHECKED BY	APPROVED BY
MB	DAC	FG

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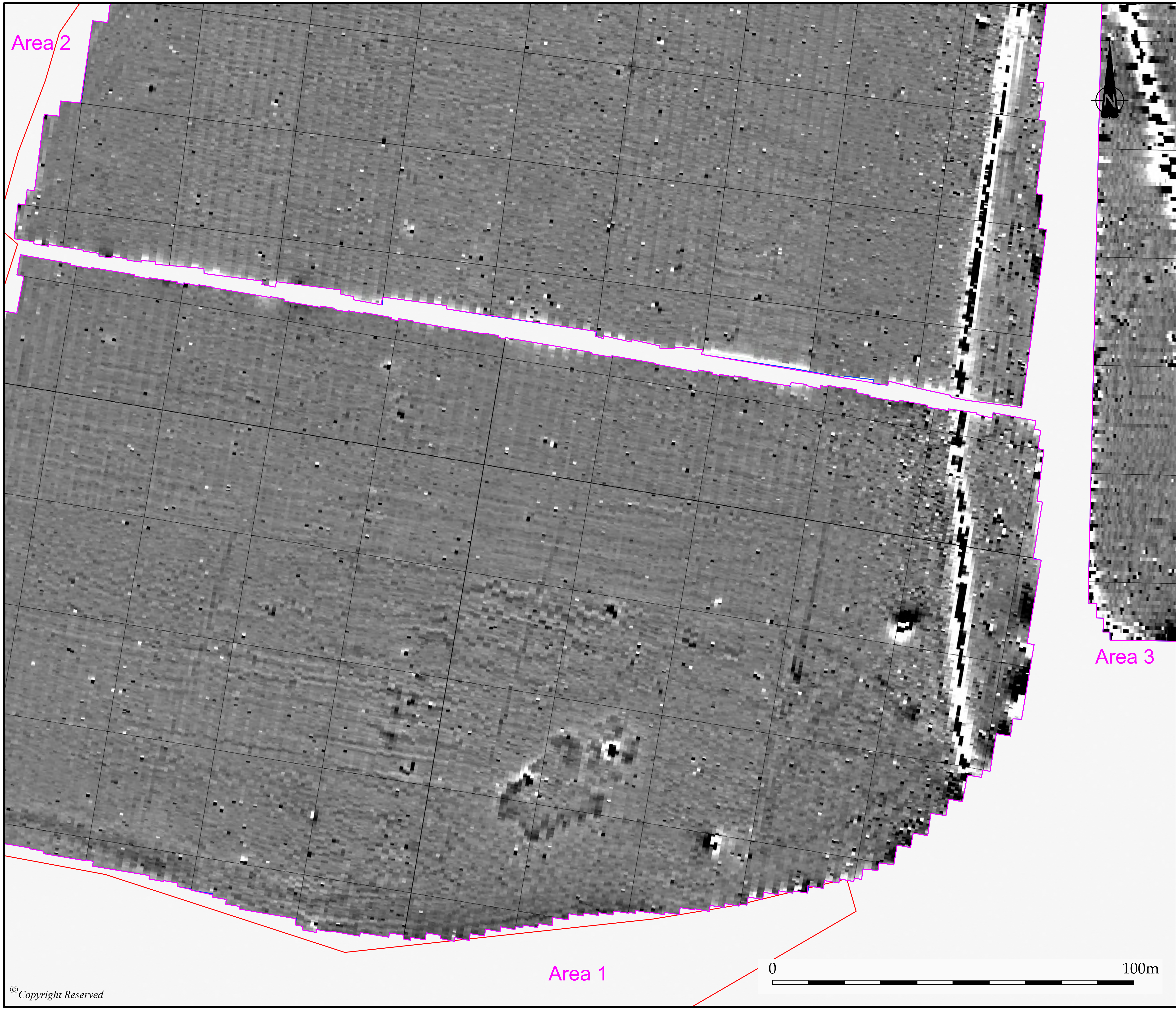

DO NOT SCALE FROM THIS DRAWING

KEY:

Site boundary

Geophysical survey area

REVISION	DETAILS	DATE	DRN	CHK'D	APP'D

CLIENT
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PROJECT
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DRAWING TITLE
Figure 4: Geophysical Survey of Area 1 East
(Raw data showing survey grid)

DRG No. CL12200-104		REV A
DRG SIZE A3	SCALE 1:1000	DATE Jan 2020
DRAWN BY MB	CHECKED BY DAC	APPROVED BY FG

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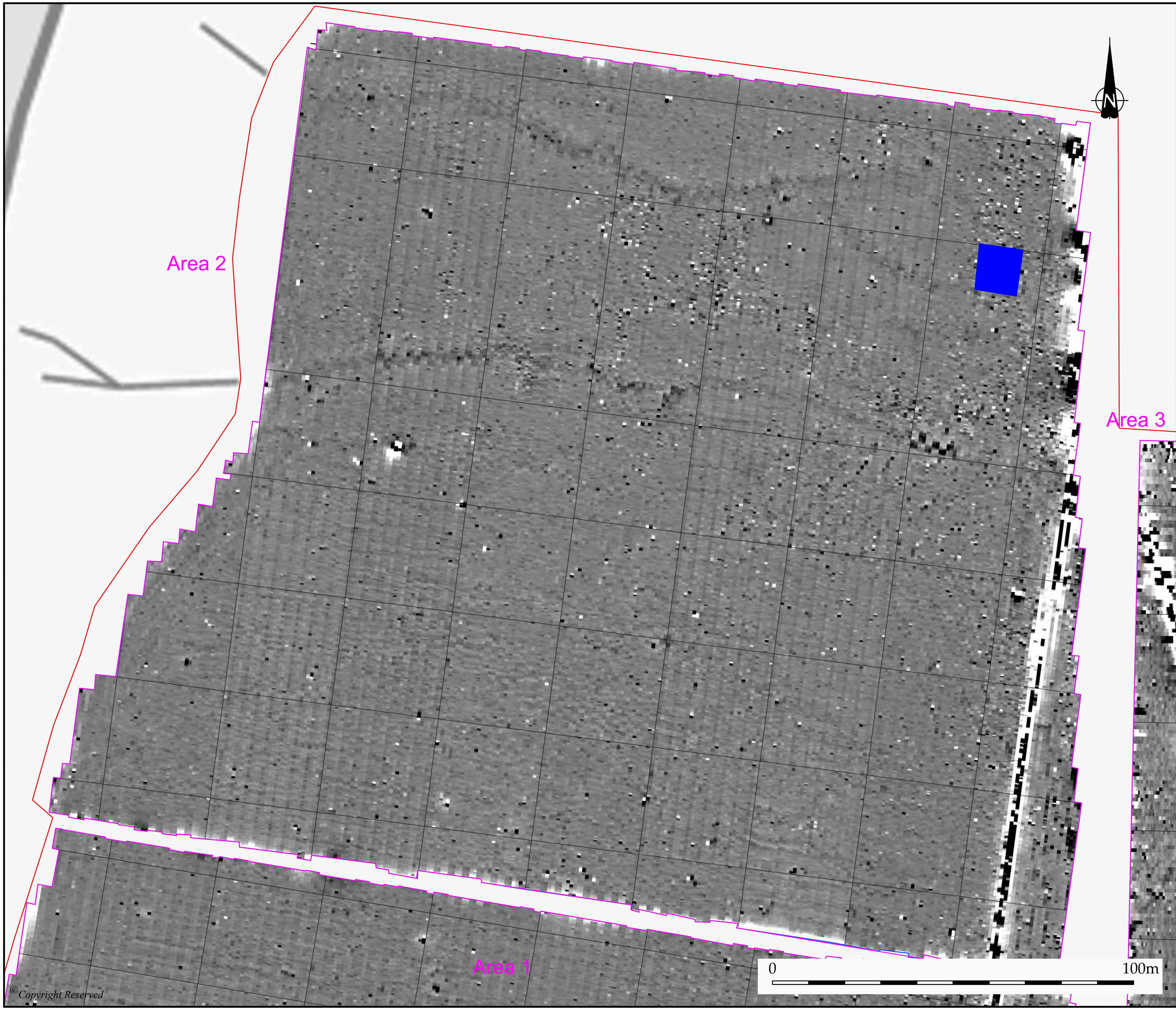
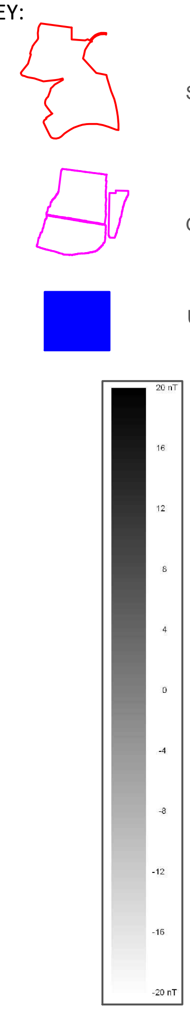


DO NOT SCALE FROM THIS DRAWING

KEY:



Site boundary

Geophysical survey area

Unable to survey (waterlogged)

REVISION	DETAILS	DATE	DRN	CHK'D	APP'D

CLIENT

Persimmon Homes (Lancashire)

PROJECT

Land at the Former Chemical Works, Whitehaven, Cumbria

DRAWING TITLE

Figure 5: Geophysical Survey of Area 2 (Raw data showing survey grid)

DRG No.		REV
CL12200-105		A
DRG SIZE: A3	SCALE: 1:1000	DATE: Jan 2020
DRAWN BY: MB	CHECKED BY: DAC	APPROVED BY: FG

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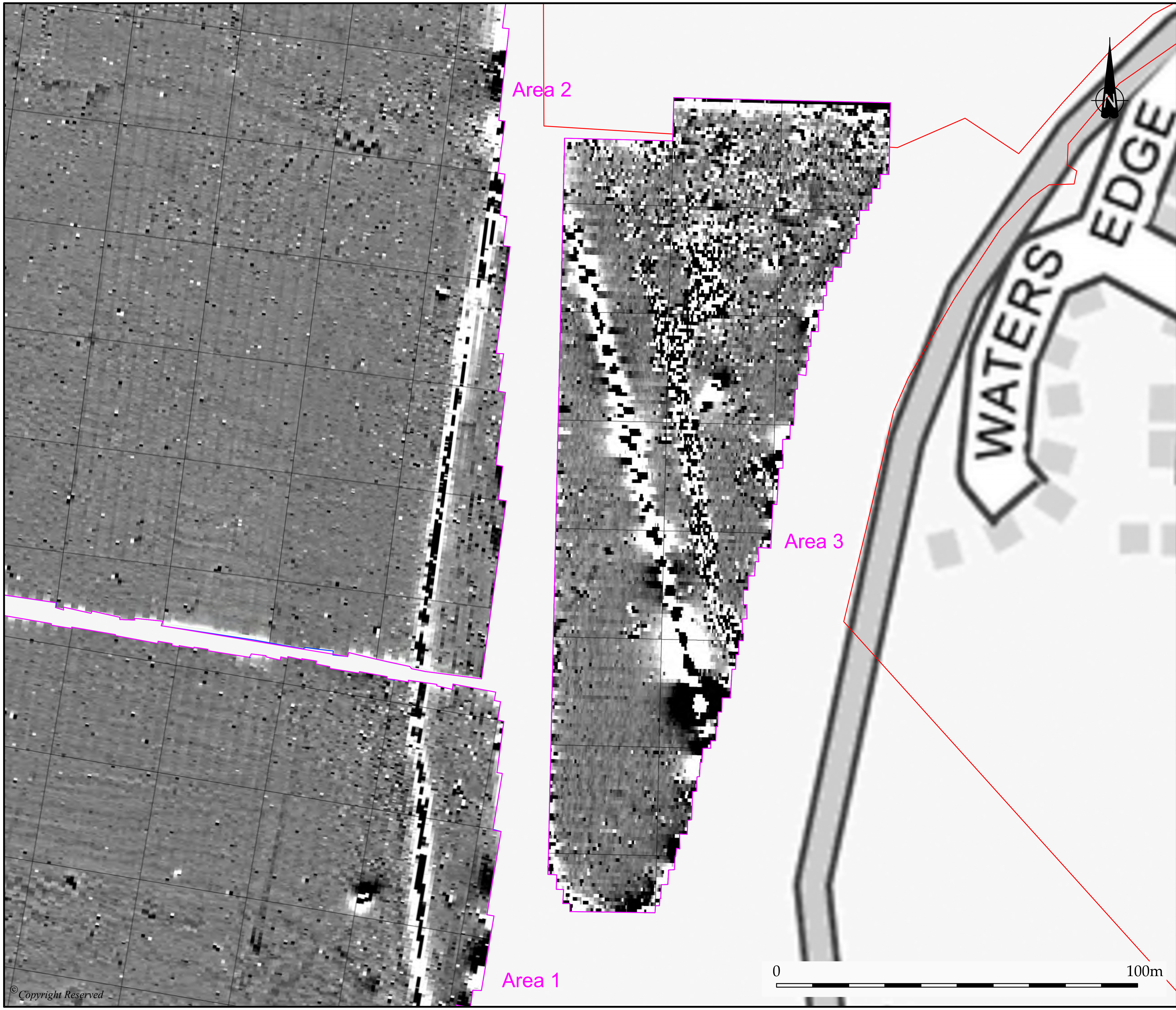

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KEY:

Site boundary

Geophysical survey area

REVISION	DETAILS	DATE	DRN	CHK'D	APP'D

CLIENT
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PROJECT
Land at the Former Chemical Works, Whitehaven, Cumbria

DRAWING TITLE
Figure 6: Geophysical Survey of Area 3 (Raw data showing survey grid)

DRG No.		REV
CL12200-106		A
DRG SIZE A3	SCALE 1:1000	DATE Jan 2020
DRAWN BY MB	CHECKED BY DAC	APPROVED BY FG

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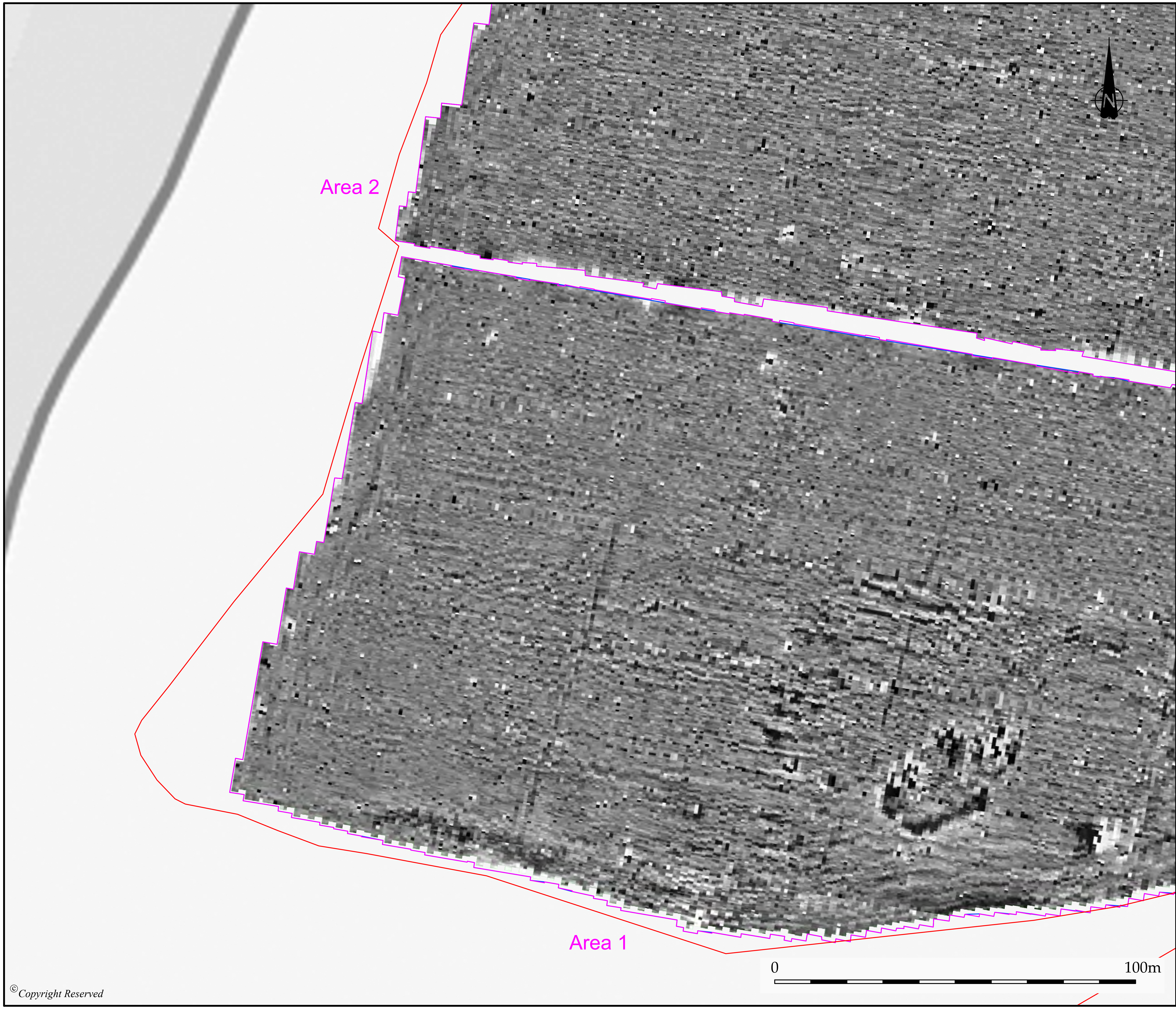
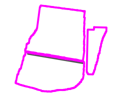
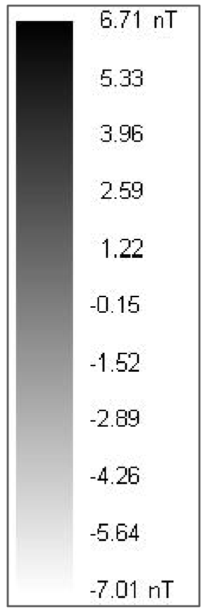


DO NOT SCALE FROM THIS DRAWING

KEY:


Site boundary


Geophysical survey area



REVISION	DETAILS	DATE	DR'N	CHK'D	APP'D

CLIENT

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DRAWING TITLE

Figure 7: Geophysical Survey of Area 1 West (Processed data)

DRG No.		REV
CL12200-107		A
DRG SIZE A3	SCALE 1:1000	DATE Jan 2020
DRAWN BY MB	CHECKED BY DAC	APPROVED BY FG

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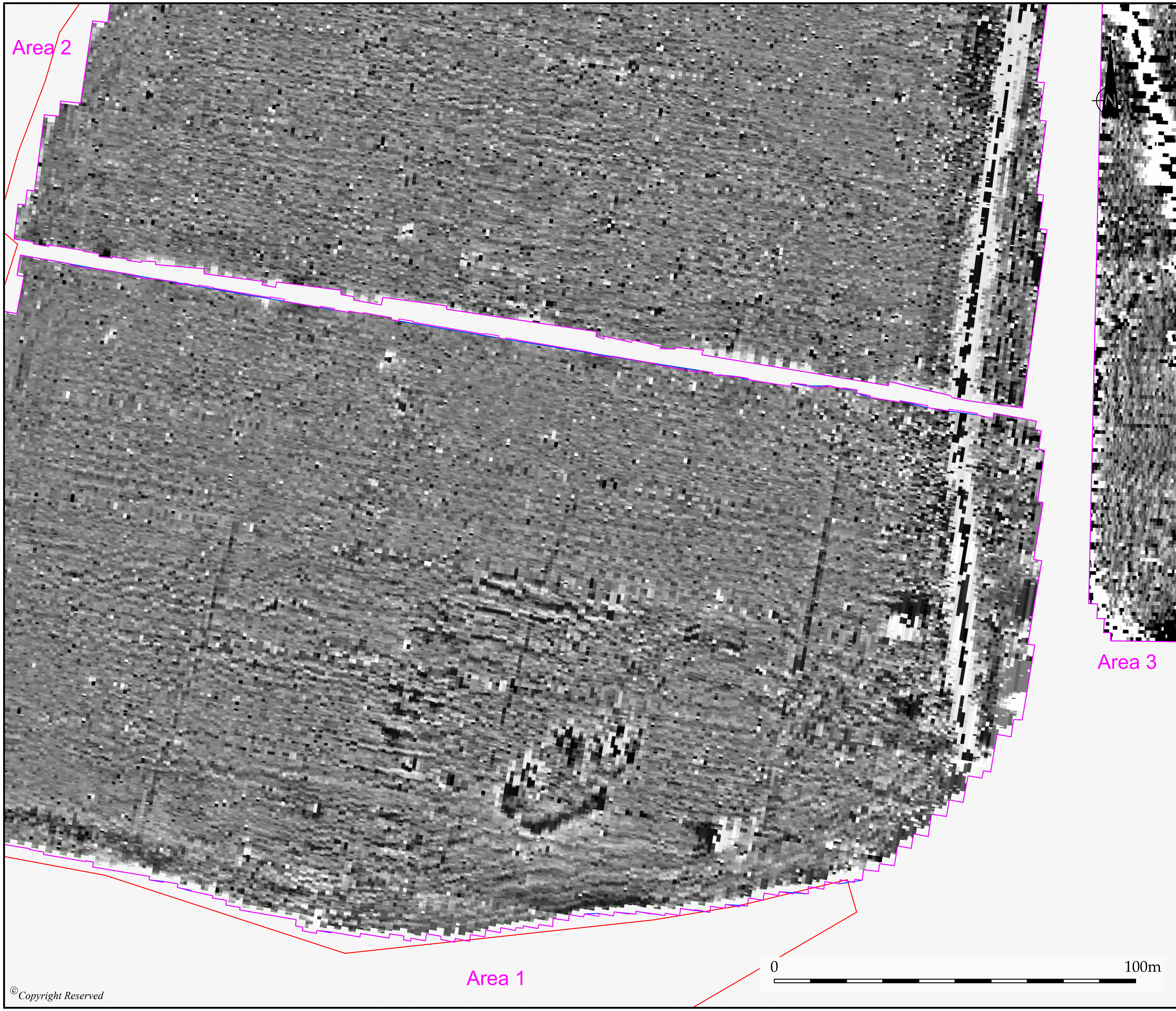

DO NOT SCALE FROM THIS DRAWING

KEY:

Site boundary

Geophysical survey area

6.71 nT
5.33
3.96
2.59
1.22
-0.15
-1.52
-2.89
-4.26
-5.64
-7.01 nT

REVISION	DETAILS	DATE	DRN	CHK'D	APP'D

CLIENT
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DRAWING TITLE
Figure 8: Geophysical Survey of Area 1 East (Processed data)

DRG No.		REV
CL12200-108		A
DRG SIZE A3	SCALE 1:1000	DATE Jan 2020
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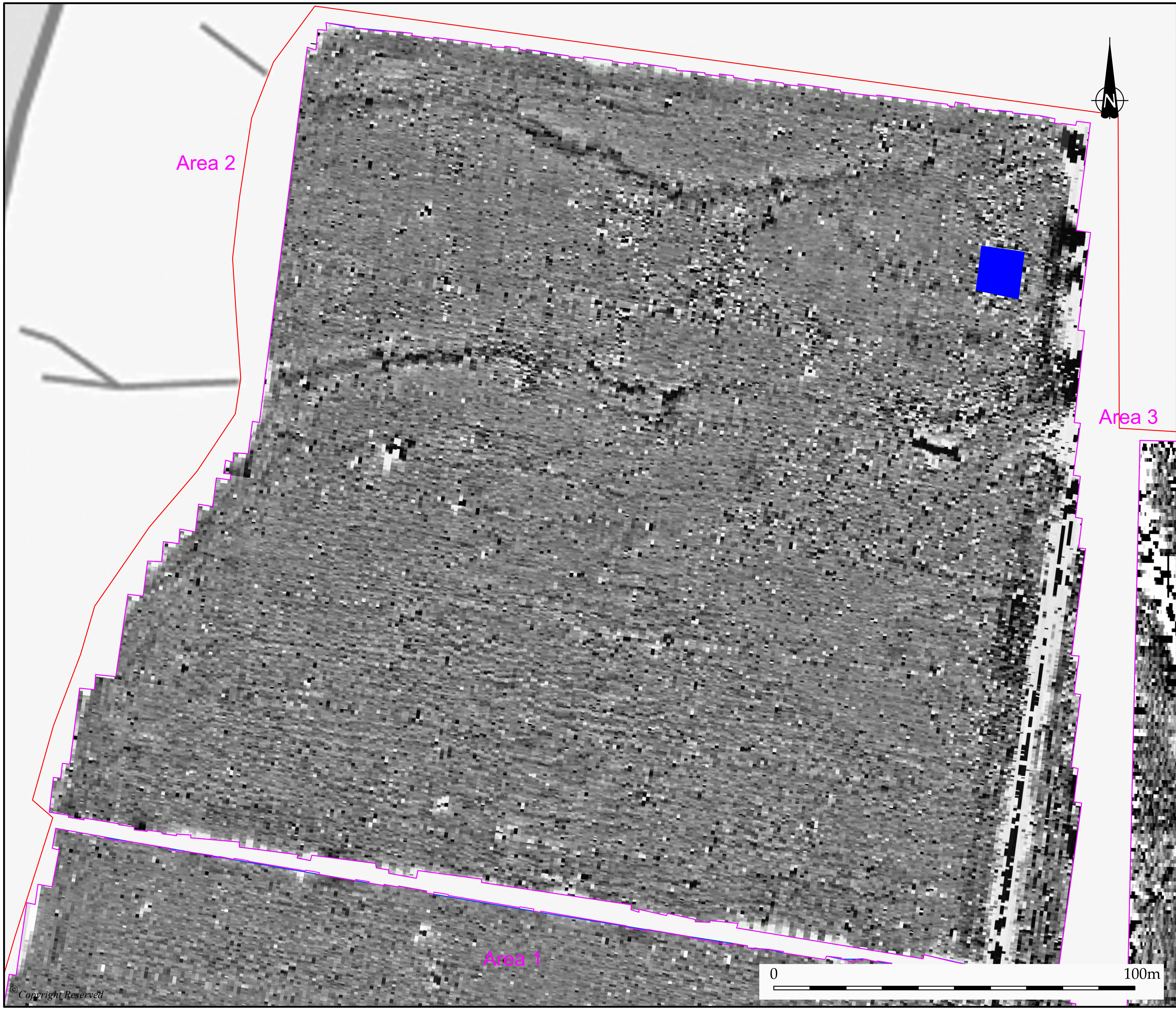

DO NOT SCALE FROM THIS DRAWING

KEY:

Site boundary

Geophysical survey area

Unable to survey (waterlogged)

6.71 nT
5.33
3.96
2.59
1.22
-0.15
-1.52
-2.89
-4.26
-5.64
-7.01 nT

REVISION	DETAILS	DATE	DRN	CHK'D	APP'D

CLIENT
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DRAWING TITLE
Figure 9: Geophysical Survey of Area 2 (Processed data)

DRG No. CL12200-109		REV A
DRG SIZE A3	SCALE 1:1000	DATE Jan 2020
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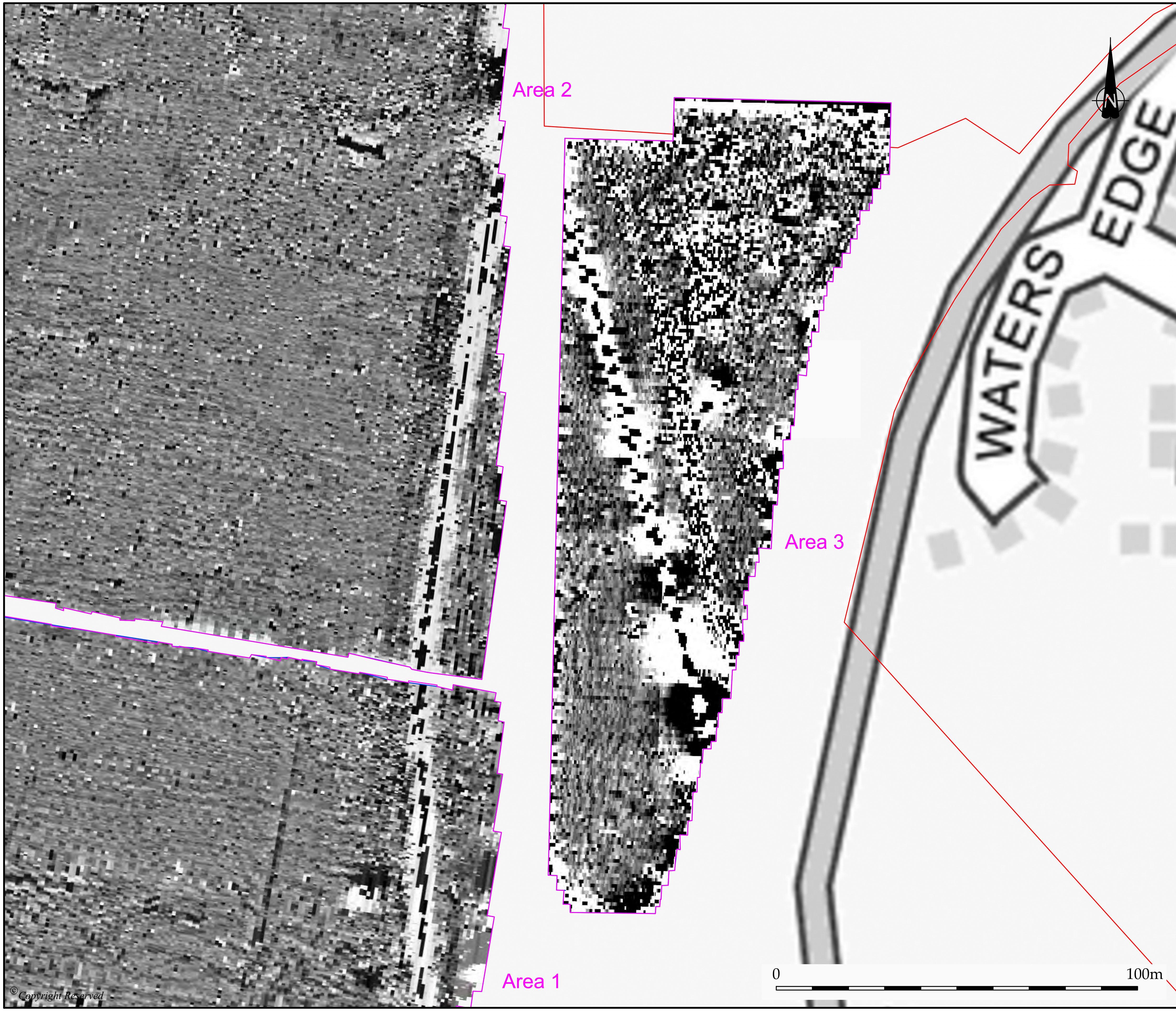

DO NOT SCALE FROM THIS DRAWING

KEY:

Site boundary

Geophysical survey area

6.71 nT
5.33
3.96
2.59
1.22
-0.15
-1.52
-2.89
-4.26
-5.64
-7.01 nT

REVISION	DETAILS	DATE	DRN	CHK'D	APP'D

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DRAWING TITLE
Figure 10:
Geophysical Survey
(Processed data) Area 3

DRG No.		REV
CL12200-110		A
DRG SIZE A3	SCALE 1:1000	DATE Jan 2020
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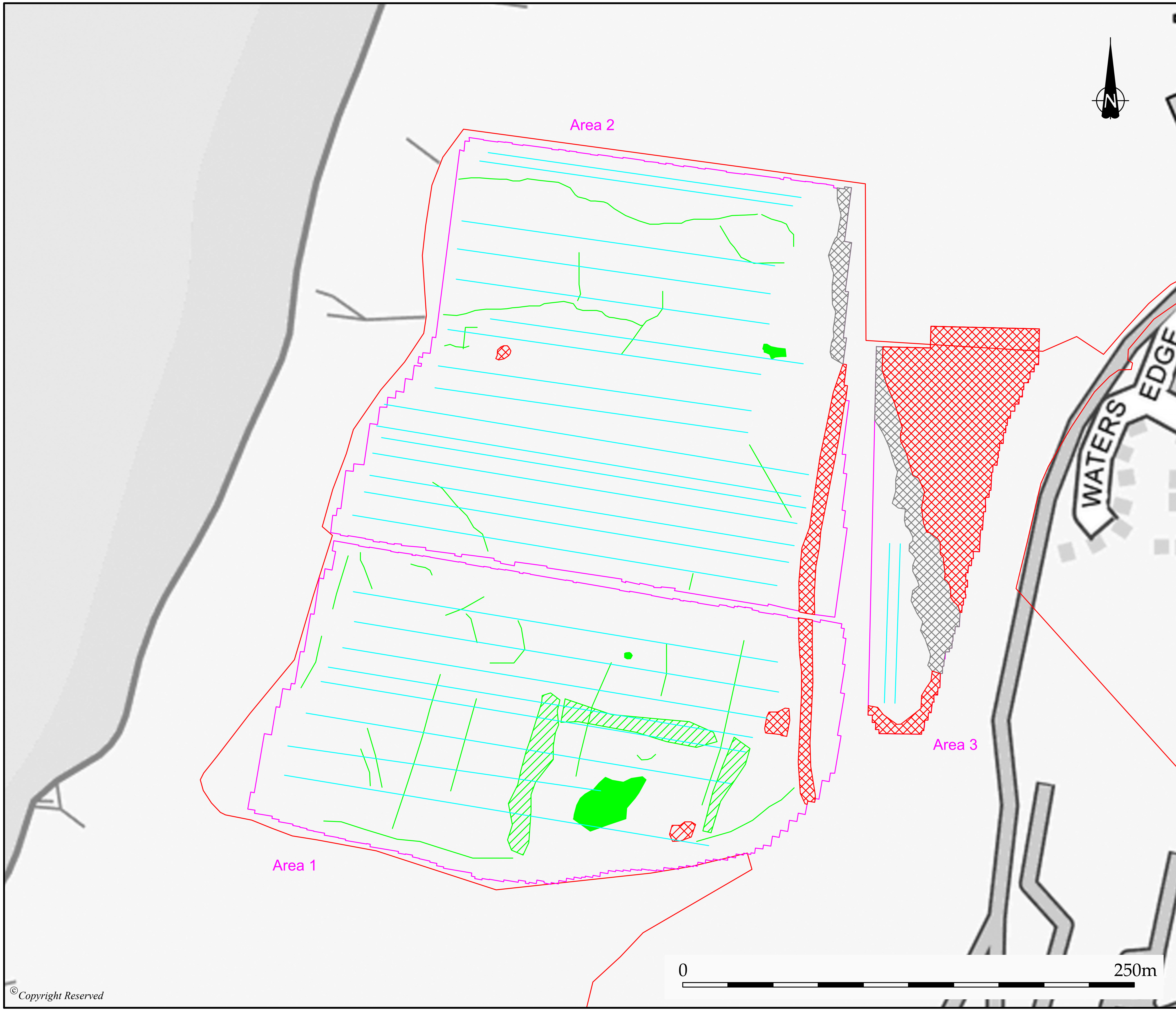

DO NOT SCALE FROM THIS DRAWING

KEY:

- Site boundary
- Geophysical Survey Area
- Positive magnetic responses
- Disturbed positive magnetic responses
- Bi-polar magnetic responses
- Di-polar magnetic responses
- Positive/ negative magnetic responses

REVISION	DETAILS	DATE	DRN	CHK'D	APP'D

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DRAWING TITLE

Figure 11:
Geophysical Survey
Geophysical Interpretation

DRG No.		REV
CL12200-111		A
DRG SIZE A3	SCALE 1:2000	DATE Jan 2020
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KEY:

- Site boundary
- Geophysical Survey Area
- possible heavily disturbed soil filled feature
- Pathway
- Possible soil filled feature
- Service
- Magnetic Disturbance
- Direction of ploughing

REVISION	DETAILS	DATE	DRN	CHK'D	APP'D

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DRAWING TITLE
Figure 12:
Geophysical Survey
Archaeological Interpretation

DRG No.		REV
CL12200-112		A
DRG SIZE A3	SCALE 1:2000	DATE Jan 2020
DRAWN BY MB	CHECKED BY DAC	APPROVED BY FG

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DO NOT SCALE FROM THIS DRAWING

KEY:

- Site boundary
- Geophysical survey area
- Heritage Asset
- Possible heavily disturbed soil filled feature
- Pathway
- Possible soil filled feature
- Service
- Magnetic Disturbance
- Direction of ploughing

REVISION	DETAILS	DATE	DRN	CHK'D	APP'D

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DRAWING TITLE
Figure 13: Geophysical Survey Archaeological Interpretation with feature labels and heritage assets

DRG No.		REV
CL12200-113		A
DRG SIZE A3	SCALE 1:2000	DATE Jan 2020
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