# EAST YORKSHIRE SOLAR FARM

## East Yorkshire Solar Farm EN010143

## **Environmental Statement**

Volume 2, Appendix 7-3: Geophysical Survey Report (Magnitude Surveys) Document Reference: EN010143/APP/6.2

Regulation 5(2)(a) Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

> November 2023 Revision Number: 00



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## **Geophysical Survey Report**

of

East Yorkshire Solar Farm,

For

AECOM

On Behalf Of Boom Power Ltd

Magnitude Surveys Ref: MSSE1401

HER Event number: TBC

October 2023



magnitude surveys

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Issue Date:

11 October 2023

## Abstract

Magnitude Surveys was commissioned to assess the subsurface archaeological potential of a c. 1,215ha area of land at East Yorkshire Solar Farm, Howden, East Riding of Yorkshire. This area comprised c. 1,157.5ha of land for solar panels and a c. 57.6ha connecting corridor route to Drax Power Station. A fluxgate gradiometer survey was successfully completed across most of the survey area, with c. 82.5ha of the main development area unable to be surveyed due to several areas of forested land and areas under environmental stewardship schemes being de-scoped. A further c. 37.4ha of the pipeline route was unable to be surveyed due to access concerns and high crop during the summer months. The survey has identified anomalies of archaeological, agricultural, natural, and undetermined origin. Three main foci of archaeological activity have been identified, comprising an area containing fragmentary enclosures and trackways, an area containing archaeological anomalies related to Caville Hall, and a final area containing fragmentary anomalies and possible kilns. Multiple areas of extensive ridge and furrow cultivation have been identified throughout the survey area.

Modern agricultural activity has also been identified in the form of footpaths, former mapped and unmapped field boundaries, and through linear anomalies relating to modern ploughing. Field drains dominate the general landscape of the survey area, which consists of low-lying, poorly draining land. In several areas close to river or drainage courses, anomalies related to alluvial flooding have been identified. Several anomalies have been identified within the survey area that relate to former farms, halls, or other buildings that have since been demolished. Anomalies classified as 'undetermined' have been detected and although these are likely to be of natural, agricultural, or modern origin, an archaeological origin cannot be ruled out completely.

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## 1. Introduction

- 1.1. Magnitude Surveys Ltd (MS) was commissioned by AECOM on behalf of Boom Power Ltd to undertake a geophysical survey on a c.1157.5ha area of land at the East Yorkshire Solar Farm, Howden, East Riding of Yorkshire (SE 75923 33546), and along a c. 57.6ha cable route connecting the scheme to Drax Power Station (SE 66751 27308).
- 1.2. The geophysical survey comprised hand-pulled/quad-towed, cart-mounted and hand-carried GNSS-positioned fluxgate gradiometer survey.
- 1.3. The survey was conducted in line with the current best practice guidelines produced by Historic England (David et al., 2008), the Chartered Institute for Archaeologists (CIfA, 2014) and the European Archaeological Council (Schmidt et al., 2015).
- 1.4. It was conducted in line with a WSI and RAMS produced by MS (Harris, 2022).
- 1.5. The survey was completed intermittently over several months as areas became available to access and conditions became favourable, commencing on 12/09/2022 and finishing on 02/06/2023.

## 2. Quality Assurance

- 2.1. Magnitude Surveys is a Registered Organisation of the Chartered Institute for Archaeologists (CIfA), the chartered UK body for archaeologists, and a corporate member of ISAP (International Society of Archaeological Prospection).
- 2.2. The directors of MS are involved in cutting edge research and the development of guidance/policy. Specifically, Dr Chrys Harris has a PhD in archaeological geophysics from the University of Bradford, is a Member of CIfA and has served as the Vice-Chair of the International Society for Archaeological Prospection (ISAP); Finnegan Pope-Carter has an MSc in archaeological geophysics and is a Fellow of the London Geological Society, as well as a member of GeoSIG (CIfA Geophysics Special Interest Group); Dr Paul Johnson has a PhD in archaeology from the University of Southampton, is a Fellow of the Society of Antiquaries of London and a Member of CIfA, has been a member of the ISAP Management Committee since 2015, and is currently the Chair of the Archaeological Prospection Community of the European Archaeological Association.
- 2.3. All MS managers have relevant degree qualifications to archaeology or geophysics. All MS field and office staff have relevant archaeology or geophysics degrees and/or field experience.

## 3. Objectives

3.1. The objective of this geophysical survey was to assess the subsurface archaeological potential of the survey area.

## 4. Archaeological Background

- 4.1. The following archaeological background summarises information provided by the client, contained within the Humber Historic Environment Record and North Yorkshire CC Historic Environment Record data in a c. 2.5km search radius around the survey area.
- 4.2. Limited archaeological finds are located within the survey area. Roman coins (MHU22193) were found in the centre of Zone 1 and a possible Romano-British settlement (MHU10775) is located in the east of Zone 1, in close proximity to a linear earthwork (MHU11423).
- 4.3. Prehistoric activity has been identified in the wider area as a round barrow at Brind Wyre (MHU15314), located adjacent to the northern boundary of Zone 3. Several ring ditches (MHU6691) have been identified in Brindley's Plantation between Zones 2 and 3.
- 4.4. Evidence of Romano-British settlement activity is generally located to the northwest and west of the survey area, with several settlement areas (MHU6503, MHU1954 and MHU10784) located within the search radius. Several iron smelting and kiln sites have been identified in close proximity to these settlement areas (MHU10799, MHU10803, MHU10801, MHU10802, MHU1156 and MHU7848). A possible Roman villa (MHU20031) has been identified between Zones 1 and 2.
- 4.5. Caville Deserted Medieval Village (MHU7760), a moated site (MHU7689) and further medieval to post-medieval features and finds (MHU20734) is located in the southeast of the survey are at the southern end of Zone 2.
- 4.6. Extensive evidence of agricultural activity within and near the survey area has been noted. Ridge and furrow cultivation (e.g MHU22511, MHU22522, MHU22505) is common across the survey area, the extent of which increases with proximity to the River Ouse. Further agricultural activity was also identified in the form of historical field boundaries (MHU9895), ditches (MHU20146) and ponds (MHU13363).
- 4.7. Further settlements and enclosures are identified in the vicinity of the survey area. Many of these settlements and enclosures are early formations of modern-day towns and villages such as Howden, Barmby on the Marsh, Spaldington, Wressle, Willitoft, and Breighton.
- 4.8. Modern activity within the c. 2.5km search radius is limited to two former RAF bases, one is the Barlow RAF base (MNY10377) which opened in 1916 and was relinquished in 1921; the other being Breighton Airfield (MHU11046), which was originally an RAF base that opened in 1942 and is now in use as an aerodrome.

## 5. Methodology

#### 5.1. Data Collection

- 5.1.1. Geophysical prospection comprised the magnetic method as described in the following table.
- 5.1.2. Table of survey strategies:

Method	Instrument	Traverse Interval	Sample Interval
Magnetic	Bartington Instruments Grad-13 Digital Three-Axis Gradiometer	1m	200Hz reprojected to 0.125m

- 5.1.3. The magnetic data were collected using MS' bespoke hand-pulled/quad-towed cart system and hand-carried GNSS-positioned system.
  - 5.1.3.1. MS' cart and hand-carried system was comprised of Bartington Instruments Grad 13 Digital Three-Axis Gradiometers. Positional referencing was through a multichannel, multi-constellation GNSS Smart Antenna RTK GPS outputting in NMEA mode to ensure high positional accuracy of collected measurements. The RTK GPS is accurate to 0.008m + 1ppm in the horizontal and 0.015m + 1ppm in the vertical.
  - 5.1.3.2. Magnetic and GPS data were stored on an SD card within MS' bespoke datalogger. The datalogger was continuously synced, via an in-field Wi-Fi unit, to servers within MS' offices. This allowed for data collection, processing, and visualisation to be monitored in real-time as fieldwork was ongoing.
  - 5.1.3.3. A navigation system was integrated with the RTK GPS, which was used to guide the surveyor. Data were collected by traversing the survey area along the longest possible lines, ensuring efficient collection and processing.

#### 5.2. Data Processing

5.2.1. Magnetic data were processed in bespoke in-house software produced by MS. Processing steps conform to Historic England's standards for "raw or minimally processed data" (see sect 4.2 in David et al., 2008: 11).

<u>Sensor Calibration</u> – The sensors were calibrated using a bespoke in-house algorithm, which conforms to Olsen et al. (2003).

<u>Zero Median Traverse</u> – The median of each sensor traverse is calculated within a specified range and subtracted from the collected data. This removes striping effects caused by small variations in sensor electronics.

<u>Projection to a Regular Grid</u> – Data collected using RTK GPS positioning requires a uniform grid projection to visualise data. Data are rotated to best fit an orthogonal grid projection and are resampled onto the grid using an inverse distance-weighting algorithm.

<u>Interpolation to Square Pixels</u> – Data are interpolated using a bicubic algorithm to increase the pixel density between sensor traverses. This produces images with square pixels for ease of visualisation.

#### 5.3. Data Visualisation and Interpretation

- 5.3.1. This report presents the gradient of the sensors' total field data as greyscale images, as well as the total field data from the lower sensors. The gradient of the sensors minimises external interferences and reduces the blown-out responses from ferrous and other high contrast material. However, the contrast of weak or ephemeral anomalies can be reduced through the process of calculating the gradient. Consequently, some features can be clearer in the respective gradient or total field datasets. Multiple greyscale images at different plotting ranges have been used for data interpretation. Greyscale images should be viewed alongside the XY trace plots. XY trace plots visualise the magnitude and form of the geophysical response, aiding in anomaly interpretation.
- 5.3.2. Geophysical results have been interpreted using greyscale images and XY traces in a layered environment, overlaid against open street maps, satellite imagery, historic maps, LiDAR data, and soil and geology maps. Google Earth (2023) was consulted as well, to compare the results with recent land usages.
- 5.3.3. Geodetic position of results All vector and raster data have been projected into OSGB36 (ESPG27700) and can be provided upon request in ESRI Shapefile (.SHP) and Geotiff (.TIF) respectively. Figures are provided with raster and vector data projected against OS Open Data.

## 6. Qualification of Results

6.1. Geophysical results are not a map of the ground and are instead a direct measurement of subsurface properties. Detecting and mapping features requires that said features have properties that can be measured by the chosen technique(s) and that these properties have sufficient contrast with the background to be identifiable. The interpretation of any identified anomalies is inherently subjective. While the scrutiny of the results is undertaken by qualified, experienced individuals and rigorously checked for quality and consistency, it is often not possible to classify all anomaly sources. Where possible an anomaly source will be identified along with the certainty of the interpretation. The only way to improve the interpretation of results is through a process of comparing excavated results with the geophysical reports. MS actively seek feedback on their reports as well as reports of further work in order to constantly improve our knowledge and service.

#### 6.2. General Statements

- 6.2.1. Geophysical anomalies will be discussed broadly as classification types across the survey area. Only anomalies that are distinctive or unusual will be discussed individually.
- 6.2.2. Data Artefact Data artefacts usually occur in conjunction with anomalies with strong magnetic signals due to the way in which the sensors respond to very strong point sources. They are usually visible as minor 'streaking' following the line of data collection. While these artefacts can be reduced in post-processing through data filtering, this would risk removing 'real' anomalies. These artefacts are therefore indicated as necessary in order to preserve the data as 'minimally processed'.
- 6.2.3. Ferrous (Spike) Discrete ferrous-like, dipolar anomalies are likely to be the result of isolated modern metallic debris on or near the ground surface.
- 6.2.4. **Ferrous/Debris (Spread)** A ferrous/debris spread refers to a concentrated deposition of discrete, dipolar ferrous anomalies and other highly magnetic material.
- 6.2.5. **Magnetic Disturbance** The strong anomalies produced by extant metallic structures along the edges of the field have been classified as 'Magnetic Disturbance'. These magnetic 'haloes' will obscure the response of any weaker underlying features, should they be present, often over a greater footprint than the structure they are being caused by.
- 6.2.6. **Undetermined** Anomalies are classified as Undetermined when the anomaly origin is ambiguous through the geophysical results and there is no supporting or correlative evidence to warrant a more certain classification. These anomalies are likely to be the result of geological, pedological or agricultural processes, although an archaeological origin cannot be entirely ruled out. Undetermined anomalies are generally not ferrous in nature.

## 7. Reporting Zone 1

## 7.1. Geographic Background

7.1.1. Zone 1 is located c. 2.6km east of Breighton Airfield and covers an area of c. 416.5ha across the northern extent of the scheme (Figure 1). Survey was undertaken across 35 fields under a variety of arable conditions. Zone 1 is bounded by further fields to the north and south, further fields and the River Foulness to the east, and by Willitoft Road to the west (Figure 2.1).

#### 7.1.2. Survey considerations:

Survey	Ground Conditions	Further Notes
Area		
1a.1	The survey area consisted of a	The survey area was bordered by hedgerow to
	flat arable field with crop	the south and drainage ditches in all other
	stubble present.	directions. The area was bisected in the centre
		by hedgerow on an east to west orientation.
1a.2	The survey area consisted of a	The survey area was bordered by hedgerow in all
	flat arable field.	directions.
1a.3	The survey area consisted of a	The survey area was bordered by hedgerow in all
	flat arable field under young	directions.
	bean crop.	
1a.4	The survey area consisted of a	The survey area was bordered by a drainage
	flat arable field. Deep furrows	ditch to the north and east, and by hedgerow in
	were present at regular intervals	all other directions. A large mound of agricultural
	within the field on an east to	waste was present along the southern boundary
	west orientation.	which was unable to be surveyed.
1a.5	The survey area consisted of a	The survey area was bordered by a drainage
	flat arable field.	ditch to the north, hedgerow to the west and by
		a treeline in all other directions. Overhead cables
		ran through the centre of the survey area on a
		northeast to southwest alignment.
1a.6	The survey area consisted of a	The survey area was bordered by a drainage
	flat drilled field that has been	ditch to the north, and hedgerow in all other
	recently sown.	directions. Overhead cables ran through the
		centre of the survey area on a northeast to
		southwest alignment, with a pylon present on
		the southern boundary. An area in the northwest
		was unable to be surveyed due to log piles and
		branches.
1a.7	Unable to be surveyed – tree	
13.8	The survey area consisted of a	The survey area was bordered by a treeline in all
	flat arable field. A small area in	directions.
	the northwest consisted of grass	
	pasture.	
1a.9	The survey area consisted of a	The survey area was bordered by a ditch to the
	flat arable field.	east and south, a wooden and metal fence and
		hedgerow to the northwest and by hedgerow
1		and trees in all other directions.

1a.10	The survey area consisted of a	The survey area was bordered by hedgerow to
	flat arable field.	the east, a drainage ditch to the west and
		hedgerows and a ditch to the north and south. A
		small section in the northeast was unable to be
		surveyed due to overgrown vegetation.
1a.11	The survey area consisted of a	The survey area was bordered by a wooden
	flat arable field.	fence to the west, hedgerows, and trees to the
		south, and by a ditch, hedgerow, and trees in all
		southwest
1a 12	The survey area consisted of a	The survey area had no boundary to the porth
10.12	flat arable field	and was bordered by bedgerows in all other
		directions.
1a.13	The survey area consisted of a	The survey area was bordered by hedgerow to
	flat arable field.	the north, east, and south, and intermittent
		trees and a ditch to the west.
1a.14	The survey area consisted of a	The survey area bordered by hedgerow and
	flat arable field.	trees in all directions.
1b.1	The survey area consisted of a	The survey area was bordered by hedgerow in all
	flat arable field.	directions, with a small area in the southeast
		having no physical boundary and a metal fence.
		Two trees were present in the centre and south
		of the survey area. A small area in the southeast
		corner was unable to be surveyed due to being
16.2	The survey area consisted of a	The survey area was berdered by bedgerow on
10.2	flat arable field	all sides
1b.3	The survey area consisted of flat	The survey area was bordered by hedgerow to
	arable field with crops.	the north, south and west and trees to the east.
		A drainage ditch was located along the northern
		boundary.
1c	The survey area consisted of a	The survey area was bordered by hedgerow to
	flat arable field.	the north, a treeline to the east and hedgerow
		and trees in all other directions.
1d	The survey area consisted of a	The survey area was bordered by hedgerows and
	flat arable field.	trees in all directions.
1e.1	The survey area consisted of a	The survey area was bordered by hedgerow to
	flat rolled field.	the west, north, and east, and by overgrown
1.2		vegetation to the south.
1e.2	I ne survey area consisted of a	The survey area was bordered by hedgerow to
	hat arable field with crop.	the west and south and sparse hedging to the
10.2	The survey area consisted of a	The survey area was bordered by bedgerow and
16.5	lightly undulating arable field	a treeline to the north and south and by
		hedgerow, metal fence and a treeline to the east
		and west. A small manure mound was present in
		the north which was unable to be surveyed.
1e.4	The survey area consisted of a	The survey area was bordered by trees and metal
	flat arable field.	wire fencing to the north and northwest, by trees
		and a ditch to the southwest, and by just trees to
		the south. There was a slight ridge to the east.

		Throughout the survey area were intermittent trees.
1e.5	The survey area consisted of a	The survey area had no physical boundary to the
	flat arable field.	west and southeast and was bordered by
		hedgerow in all other directions.
1e.6	The survey area consisted of a	The survey area was bordered by a ditch to the
	flat arable field.	south and by hedgerow in all other directions.
1e.7	The survey area consisted of a	The survey area was bordered by a ditch to the
	flat arable field with crop	south and east and by hedgerow to the north
	stubble present.	and west.
1e.8	The survey area consisted of a	The survey area was bordered by a treeline to
	flat arable field.	the north and east and by hedgerow and a
		treeline to the south and west.
1e.9	The survey area consisted of a	The survey area had no physical boundary to the
	flat arable field with crop	north, a ditch to the west and south, and
	stubble present.	hedgerow to the southwest, east, and south.
1e.10	The survey area consisted of a	The survey area was bordered by hedgerow and
	flat grass field.	a ditch to the east and west and by hedgerow in
		all other directions. A small strip in the centre,
		and large strips along the eastern and western
		boundaries were unable to be surveyed due to
		overgrown vegetation.
1e.11	The survey area consisted of a	The survey area was bordered by a ditch to the
	flat arable field.	south, and by hedgerow and a treeline in all
		other directions. A stream ran along the eastern
		boundary.
1e.12	The survey area consisted of a	The survey area was bordered by hedgerow in all
	flat arable field.	directions. Telegraph poles and overhead cables
		were oriented through the centre of the survey
10.12	The survey area consisted of a	The survey area was herdered by hedgerow in all
16.13	flat arable field	directions. Tolograph polos and overboad cables
		were oriented through the centre of the survey
		area on a northwest to southeast alignment
1e 14	The survey area consisted of a	The survey area had no physical boundary to the
(east)	flat arable field	west a ditch to the north and was bordered by
(0000)		hedgerow to the east and south.
1e.14	The survey area consisted of a	The survey area had no physical boundary to the
(west)	flat arable field.	east and was bordered by hedgerow in all other
		directions. Overhead cables and telegraph poles
		were oriented east to west in the centre of the
		survey area. A metal manhole cover was present
		in the southeast.
1e.15	Unable to be surveyed –	
	overgrown	
1. 1.0	vegetation/stewardship	
16.16	rne survey area consisted of an	Ine survey area was bordered by a road and
	arable field, lightly sloping to the	hence to the west, tall grass to the northeast and
10.17	The survey area consisted of a	by neugerow in an other directions.
16.11	flat arable field	directions. Overhead cables and telegraph relac
	וומג מומטוב וופוע.	anections. Overneau capies and telegraph poles

		were oriented west to east across the middle of the survey area. A strip of long grass along the
		western boundary was unable to be surveyed
		western boundary was drable to be surveyed.
1f.1	The survey area consisted of a	The survey area was bordered by hedgerow in all
	flat pasture field.	directions. Overhead cables and telegraph poles
		were oriented through the centre of the survey
		area on an east to west alignment. Large areas
		along the north, east and southern boundaries
		were unable to be surveyed due to overgrown
		vegetation.
1f.2	Unable to be surveyed –	
	stewardship scheme	

- 7.1.3. The underlying geology consists of Triassic mudstones of the Mercia Mudstone Group. The superficial deposits in the majority of Zone 1 consist of clay and silt of the Thorganby Clay Member, with sand and clay of the Skipwith Sand Member in the west of Area 1a.2, and alluvial clay, peat, and silt in Area 1e.15 and the east of Areas 1e.11, 1e.14 and 1e.16 (British Geological Survey, 2023).
- 7.1.4. The soils in the majority of Zone 1 consist of slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils, with freely draining slightly acid sandy soils in Areas 1a.1 and 1a.2, and loamy and clayey floodplain soils with naturally high groundwater in Areas 1e.11, 1e.14 and 1.e15 (Soilscapes. 2023).

#### 7.2. Results

#### 7.2.1. Summary

- 7.2.1.1. The fluxgate gradiometer survey was successfully undertaken over c. 416.5ha, with c. 30ha unable to be surveyed due to the presence of stewardship and tree planting schemes. Modern disturbance is limited to buried services and field edges.
- 7.2.1.2. Within Zone 1, only one focus of possible archaeological activity has been identified, in the form of a possible partial enclosure and related anomalies which may be associated with possible kilns.
- 7.2.1.3. Extensive agricultural activity has been identified within this zone in the form of multiple mapped boundaries, ridge and furrow ploughing trends, drainage features, and modern ploughing trends.
- 7.2.1.4. Large spreads of green waste are present within areas in the east of this zone, which may obscure other anomalies from being identified. Anomalies related to the natural deposition of sediment upon the floodplains have also been identified.
- 7.2.1.5. Multiple anomalies have been identified and classified as 'Undetermined'. These anomalies lack the contextual evidence needed to accurately classify them, and although they are likely modern, agricultural, or natural in origin, an archaeological origin cannot be ruled out.

#### 7.2.2. Interpretation of Magnetic Results – Specific Anomalies

- 7.2.2.1. **Possible Archaeology (Strong, Weak & Spread)** Within the centre of Area 1e.10, a small spread of dipolar, subcircular and linear anomalies has been identified (Figure 17). This feature may represent a possible enclosure due to its rectilinear configuration, with the strong subcircular anomalies within representing possible kilns due to their signal and presence of several Romano-British kiln sites within the wider landscape (see section 4.4).
- 7.2.2.2. Agricultural (Strong, Weak & Spread) Within Areas 1a.1, 1a.9, 1a.14, 1e.10, 12,11 and 1e.16 strong and weak linear and curvilinear anomalies have been identified in linear alignments (Figures 5, 8, 11, 17, 20, 23, 25 and 28). These anomalies align with field boundaries visible on historical OS mapping.
- 7.2.2.3. Drainage Features Across most of this zone, alignments of strong and weak parallel linear anomalies have been identified. These anomalies are indicative of drainage features, with some anomalies in Areas 1a.1 and 1a.12 (Figures 4 and 10), exhibiting strong dipolar signals indicative of ceramic drains, while others display a strong positive signal probably representing the homogenously enhanced fill of cut drains ((Areas 1a.2, 1a.8, 1a.9, 1a.10, 1a.12, 1e.3, 1e.5 and 1e.17) (Figures 4, 7, 10, 13 and 22)).
- 7.2.2.4. Ridge and Furrow Across most of this zone, parallel alignments of weak linear and curvilinear anomalies have been identified (Figures 5, 8, 11, 14, 17, 20, 23, 25 and 28). These anomalies are indicative of ridge and furrow ploughing regimes due to their morphology and general 7–10m spacing between them. Many of these anomalies correspond with known features in the Historic Environment Record (see Section 4.4).
- 7.2.2.5. Agricultural (Trend) Across many of the fields within Zone 1, linear anomalies have been identified (Figures 5, 8, 11, 14, 17, 20 and 23). These anomalies are likely related to modern ploughing trends, and align with ploughing directions visible in satellite imagery.
- 7.2.2.6. **Ferrous (Spread)** Large spreads of strong dipolar anomalies are present within Areas 1e.11, 1e.14 and 1e.16 (Figures 14, 17, 20 and 23). These spreads are related to green waste and may partially obscure other anomalies within these areas.
- 7.2.2.7. Natural (Strong & Weak) Numerous curvilinear anomalies have been identified within Areas 1e.11, 1e.14 and 1e.16, which are visible as cropmarks in satellite imagery (Figures 8, 14, 17 and 20). These anomalies are likely related to the alluvial overwash sediments in the floodplain of the adjacent River Foulness.
- 7.2.2.8. **Undetermined** Within multiple Areas across Zone 1, linear and curvilinear anomalies of varying strengths have been identified. These anomalies lack the contextual evidence needed to accurately classify them, and although they are likely modern, agricultural, or natural in origin, an archaeological origin cannot be ruled out.

## 8. Reporting Zone 2

## 8.1. Geographic Background

8.1.1. Zone 2 is located c. 4km southeast of Breighton Airfield and c. 3.6km northwest of Eastrington, covering an area of c. 450.58ha across the centre of the survey area (Figure 1). Survey was undertaken across 20 fields. Zone 2 is bounded by Spaldington to the north and North Howden to the south, further fields and the A614 to the east, and by Wood Lane to the west (Figure 2.2).

Survey	Ground Conditions	Further Notes
Area		
2a.1	The survey area consisted of a flat arable field.	The survey area was bordered by a ditch to the east, a wooden fence to the south and hedgerow and a treeline to the north and west.
2a.2	The survey area consisted of a bumpy pasture field.	The survey area was bordered by a metal fence to the north, a metal fence and treeline in all other directions. Two large metal cow troughs were present in the southeast of the survey area.
2a.3	The survey area consisted of a flat pasture field.	The survey area was bordered by a hedgerow and a ditch to the south and a treeline in all other directions. Overhead cables and telegraph poles are oriented east to west through the centre of the survey area.
2a.4	The survey area consisted of a flat pasture field. Sections on the eastern and southwestern boundaries were unable to be surveyed due to overgrown vegetation.	The survey area was bordered by a wooden fence to the north, treeline to the west, and a ditch to the south and east.
2b.1	The survey area consisted of a flat arable field.	The survey area was bordered by a metal fence and hedgerow to the north and west, a trackway to the south and had no physical boundary to the east and southwest. There was an antenna was present in the southwest corner surrounded by a large metal fence.
2b.2	The survey area consisted of a flat arable field.	The survey area was bordered by a metal fence and hedgerow to the north and west, a trackway to the southeast, a treeline to the south and had no physical boundary to the northeast. There was an antenna was present in the southeast corner surrounded by a large metal fence.
2c	The survey area consisted of a flat bumpy arable field to the southwest and flat grass pasture to the northeast.	The survey area was bordered by hedgerow in all directions.

#### 8.1.2. Survey considerations:

2d	The survey area consisted of a	The survey area was bordered by a ditch to the
	flat arable field.	northeast, a wire fence to the southeast, and a
		hedgerow to the west.
2e.1	The survey area consisted of a	The survey area was bordered by a treeline to
	That arable field.	the east, a trackway to the west, nedgerow to
		south. Overhead cables and telegraph poles
		were oriented along the northern boundary.
2e.2	The survey area consisted of	The survey area was bordered by hedgerow to
	flat arable land with young	the west and south and a fence to the north. To
	crops.	the northwest and east, there were no physical
		boundaries. A wind turbine was located just
20.2	The survey area consisted of	north of the survey area.
20.5	flat arable land with crop	south by bedgerow, to the west by a trackway
	hat arable land with crop.	and to the north there was a raised ridge.
2e.4	The survey area consisted of	The survey area was bordered by hedgerow to
	flat arable land with young	the north, west, east, and southwest. A ditch
	crops.	was located to the southeast.
2f.1	The survey area consisted of a	The survey area was bordered by hedgerow to
	flat arable field.	the north, west, and south, and there was no
2f 2	The survey area consisted of a	physical boundary to the east.
21.2	flat arable field	and trees to the north east and south and had
		no physical boundary to the west.
2g.1	The survey area consisted of a	The survey area was bordered by a treeline to
	flat arable field.	the north and west, and by a ditch to the south
		and east. Overhead cables and telegraph poles
		were oriented north to south through the
2	The survey area consisted of an	centre of the field.
2g.2	arable field lightly sloping	north and northeast a track to the east and
	down to the centre from the	south, and hedgerow and fence to the
	east and west. Crop stubble in	southwest and west. A section to the
	the northern half, and a small	northwest of the area was bound by hedge. A
	section in the northwest was	pond was in the northwest and a hole in the
	grassland.	northeast.
2g.3	The survey area consisted of a	The survey area was bordered by a ditch to the
	That arable field.	south and by bedgerow to the southeast A
		large tree was located within the centre of the
		survey area. Overhead cables and telegraph
		pole were oriented north to south through
		southeast of the survey area.
2g.4	The survey area consisted of an	The survey area was bordered by a trackway to
	the north and past from the	the west and by a ditch in all other directions.
	southwest	the north of the survey area
2g.5	The survey area consisted of a	The survey area had no physical boundary to
-0.5	flat arable field.	the west, was bordered by a ditch to the north,
		and by a slope and road to the east and south.

		Overhead cables and telegraph poles were oriented north to south through the west of the survey area.
2g.6	The survey area consisted of a	The survey area was bordered by a ditch to the
	flat arable field.	west, and a treeline in all other directions.

- 8.1.3. The underlying geology in the majority of Zone 2 consists of mudstone of the Mercia Mudstone Group, and sandstone of the Sherwood Sandstone Group in the south of Area 2d and northwest of Areas 2a.1, 2a.2, 2a.3 and 2a.4. The superficial deposits consist of clay and silt of the Thorganby Clay Member (British Geological Survey, 2023).
- 8.1.4. The soils in Zone 2 consist of slowly permeable, seasonally wet, slightly acid but base-rich loamy and clayey soils, with impeded drainage (Soilscapes, 2023).

#### 8.2. Results

#### 8.2.1. Summary

- 8.2.1.1. The fluxgate gradiometer survey was successfully completed across the entirety of the survey area within Zone 2. Modern disturbance is limited to modern services crossing the area and disturbance from field boundaries.
- 8.2.1.2. Within Zone 2 multiple features related to probable and possible archaeological activity have been identified. Multiple assemblages of anomalies are present in the southeast of the survey area, which represent numerous small clusters of rectilinear partial enclosures and related anomalies that may be representative of trackways, ditches, or field boundaries. One focus of archaeological activity lies in proximity to the site of Caville Hall and may represent features related to the building and its grounds. The fragmentary nature of the majority of the anomalies in this zone makes a definitive interpretation difficult, particularly regarding provenience.
- 8.2.1.3. Agricultural activity has been identified within this zone in the form of multiple mapped boundaries and drainage ditches, ridge and furrow cultivation, drainage features, and modern ploughing trends.
- 8.2.1.4. Large spreads of green waste are present within areas in the east of this zone, which may obscure other anomalies if present. Anomalies related to the natural movement of sediment upon the floodplains have been identified.
- 8.2.1.5. Multiple anomalies have been identified and classified as 'Undetermined'. These anomalies lack the contextual evidence needed to accurately classify them, and although they are likely modern, agricultural, or natural in origin, an archaeological origin cannot be ruled out.

#### 8.2.2. Interpretation of Magnetic Results – Specific Anomalies

8.2.2.1. **Probable Archaeology (Strong & Weak) [Area 2g.2]** – Within the northwest of Area 2g.2, an assemblage of weak and strong linear and discrete anomalies has been identified **[2g.2.A]** (Figures 50, 58, 61 and 64). This assemblage presents a

morphology indicative of multiple partial enclosures and related trackways. One such trackway [2g.2.B], oriented north to south, to the west of this assemblage appears to lead towards a second area of archaeological activity [2g.2.C]. This second assemblage of linear and dipolar anomalies of varying strength also displays a morphology indicative of multiple partial rectilinear enclosures. Upon the eastern boundary of Area 2g.2, a strong 'L'-shaped anomaly [2g.2.D], with related dipolar anomalies have been identified. These anomalies present a further partial enclosure, that appears to continue beyond the boundary of the survey area. Within the northeast of Area 2g.2 a further linear alignment of strong and weak anomalies [2g.2.E] has been identified. This assemblage of anomalies appears to be in alignment with a series of previously idenitifed field boundaries (Section 7.1.3), and thus may represent part of an historical field system, or trackway with a small rectilinear enclosure toward the western end of the feature. The majority of the survey area within the scheme is extremely flat, but Area 2g.2 comprises the northern face of a small slope, on which the archaeological anomalies [2g.2C] to [2g.2.E] lie on the same contour, suggesting a possibly contemporaneous relationship. The orientation of trackways between these various areas of archaeological activity further suggests the possibility of a relationship between them. Mapped field boundaries have been identified on a similar orientation to the probably archaeological features, and may represent continuity or reuse in later periods.

- 8.2.2.2. Probable and Possible Archaeology (Strong & Weak) Within the south of Area 2g.4, several curvilinear and discrete anomalies have been identified [2g.4.A] which may represent a partial enclosure (Figures 53 and 70). These anomalies do not lie on the same orientation as the previously identified features to the west in Area 2g.2, and the distance between them means that they are likely not related. They do not align with any features on historical mapping, or in the Historic Environment Records, but nonetheless are likely represent probable and possible archaeological features.
- 8.2.2.3. Probable Archaeology (Caville Hall) (Strong & Spread) Within the centre of Area 2g.3 a small assemblage of strong dipolar anomalies has been identified within an area of discrete dipolar anomalies [2g.3.A] (Figures 56 and 67). These anomalies align with a building and former field boundaries visible in historical OS maps, and probably represent the remains of a former outbuilding in the grounds of Caville Hall.
- 8.2.2.4. **Possible Archaeology (Caville Hall) (Strong and Weak)** –Within the northeast of Area 2g.3 multiple weak and strong linear and discrete anomalies have been identified **[2g.3.B]** (Figures 56 and 67). Many of these anomalies align with buildings and boundaries visible on historical OS mapping, and may be related to the nearby Caville Hall, earlier settlement activity in this location, or an historical field system and enclosures. The fragmentary nature of these anomalies makes precise interpretation of distinct features such as individual enclosures or buildings more difficult. Most of these anomalies are also located within areas of noise. This

noise may relate to destroyed archaeological material being distributed through modern agricultural activity, but as the debris is located in the gateway of the current farm it is more likely to result from material spread in modernity to consolidate the ground around the entrance.

- 8.2.2.5. Agricultural (Strong, Weak & Spread) Within Areas 2b.2, 2c, 2e.1, 2f.2, 2g.2, and 2g.5 strong and weak linear and curvilinear anomalies have been identified in linear alignments (Figures 35, 38, 44, 47, 50, 53, 56, 58, 61, 64, 67 and 70). These anomalies align with field boundaries visible on historical OS mapping. A similar alignment of linear and dipolar anomalies is present within the northwest of Area 2g.5, which aligns with a footpath visible on historical OS mapping (Figures 53).
- 8.2.2.6. Drainage Feature Across most of this zone, particularly in lower lying regions, alignments of strong and weak parallel linear anomalies have been identified. These anomalies are indicative of drainage features, with some anomalies exhibiting strong dipolar signals indicative of ceramic field-drains.
- 8.2.2.7. Ridge and Furrow Within Areas 2a.4, 2g.2, 2g.3, 2f.2, 2g.1 and 2g.6, parallel alignments of weak linear and curvilinear anomalies have been identified (Figures 32, 50, 53 and 56). These anomalies are indicative of ridge and furrow ploughing regimes due to their morphology and the general 6-10m spacing between them, often corresponding with features identified in the historic environment records.
- 8.2.2.8. Agricultural (Trend) Across many of the fields within Zone 2, linear anomalies have been identified (Figures 32, 35, 47, 50, 53 and 56). These anomalies are likely related to modern ploughing trends, and align with ploughing directions visible in satellite imagery.
- 8.2.2.9. Magnetic Disturbance (Brindcommon Farm) Along the southwestern edge of Area 2d, several large ferrous anomalies have been identified [2d.A] (Figure 41). These large anomalies correlate with the site of a former farm, Brindcommon Farm, found on historical OS mapping. Unlike structural debris from other buildings, these anomalies do not appear to present any obvious structural features that align with known walls, and thus may represent material buried following demolition of the site. These anomalies are also located within an area of intense noise, compared to the rest of the field which also appears to have been covered in green waste at some point. This intense noise is also likely to represent rubble or former building material associated with the former farm.
- 8.2.2.10. Ferrous (Spread) Large spreads of strong dipolar anomalies are present across most of Areas 2c and 2d (Figures 38 and 41). These spreads are related to green waste and may partially obscure visible of other anomalies within the data.
- 8.2.2.11. Undetermined (Strong & Weak) Within Areas 2g.2, 2g.1, 2g.4, and 2g.5 linear discrete anomalies have been identified. These anomalies lack the contextual evidence needed to accurately classify them, and although they are likely modern, agricultural, or natural, an archaeological origin cannot be ruled out.

## 9. Reporting Zone 3

## 9.1. Geographic Background

9.1.1. Zone 3 is located c. 1.7km east of Wressle and c. 2.8km northwest of Howden, comprising an area of c. 263.8ha (Figure 1). Survey was undertaken across 7 fields. Zone 3 is bounded by Brind Lane to the north, fields to the east and south and by Rowlandhall Lane to the west. A railway bisected the survey areas on an east-west orientation (Figure 2.3).

Survey	Ground Conditions	Further Notes
Area		
3a	The survey area consisted of a	The survey area was bordered by hedgerow to
	flat arable field containing	the north and west and by trees, ditches, and a
	young crop.	road to the east and south. An overhead cable
		was identified within the west of the survey area
		running in a northeast-southwest orientation.
3b.1,	The survey area consisted of 3	The survey area had no physical boundary to the
3b.2,	flat arable fields with no internal	southeast, was partially bordered by a wooden
3b.3	divisions, and was surveyed	fence and hedgerow to the north and was
	together.	bordered by hedgerow in all other directions.
		Telegraph poles and overhead cables were
		oriented northeast to southwest through the
		centre of the survey area. Agricultural machinery
		was present in the southwest of the survey area.
		A thin treeline oriented north to south in the
		centre of the survey area was unable to be
		surveyed.
30.4	The survey area consisted of a	The survey area had no physical boundary to the
	stubble present	northwest, was bordered by a treeline to the
	stubble present.	directions
3c 1	The survey area consisted of a	The survey area was bordered by bedgerow to
50.1	flat arable field with grassland	the west a treeline to the north and southwest
	areas to the southwest and	and by a track in all other directions. Cultivated
	northeast	strips were present at regular intervals oriented
		east to west within the survey area.
3c.2	Unable to be surveyed – trees	
3c.3	Unable to be surveyed – trees	
3c.4	Unable to be surveyed – trees	
3c.5	Unable to be surveyed – trees	
3c.6	The survey area consisted of a	The survey area had no physical boundary to the
	flat arable field.	north and was bordered by a ditch to the west.
		The survey area was bordered by large sections
		of young trees to the south and west which were
		unable to be surveyed.
3c.7	The survey area consisted of a	The survey area was bordered by trees, a fence,
	flat arable field containing	and hedges to the north, northeast, south and
	young crop.	west. There was a ditch and trees to the east.

3c.8	The Survey area consisted of a	The survey area was bordered by trees to the
	flat arable field containing	north, east and south and by trees and a ditch to
	young crop.	the west.

- 9.1.3. The underlying geology in the majority of Zone 3 primarily consists of sandstone of the Sherwood Sandstone Group, with mudstone of the Mercia Mudstone Group in the north of Areas 3a and 3b.1. The superficial deposits consist of clay and silt of the Hemingbrough Glaciolacustrine Formation.
- 9.1.4. The soils in Zone 3 consist of slowly permeable, seasonally wet, slightly acid but baserich loamy and clayey soils, with impeded drainage.

#### 9.2. Results

#### 9.2.1. Summary

- 9.2.1.1. The gradiometer survey was successfully carried out over c. 209.8ha of Zone 3, with c. 54ha de-scoped due to the presence of forested land. The impact of modern activity is present within the survey area as interference around the field perimeters, buried services and pylons with overhead cables. The presence of large magnetic haloes from these features within the zone may mask weaker anomalies, if any were present. Spreads of 'ferrous debris' have also been identified throughout the survey area highlighting the widespread use of green waste as fertilizer throughout the zone. The magnetic disturbance has not impacted the identification of other, more weakly enhanced anomalies elsewhere within the survey area, including those interpreted as agricultural and natural in origin.
- 9.2.1.2. No anomalies have been identified within Zone 3 that are clearly suggestive of archaeological features, although an anomaly classified as 'undetermined' has been detected. The survey has primarily detected anomalies associated with the historical and modern agricultural utilisation of the landscape.
- 9.2.1.3. A significant presence of strong discrete anomalies has been identified surrounding the former site of Pricket Hall, which likely represent the presence of rubble and possible demolished features.
- 9.2.1.4. Historical agricultural activity has been identified within this zone in the form of multiple mapped and unmapped field boundaries, and extensive ridge and furrow ploughing trends. Modern agricultural activity has also been identified as modern ploughing regimes and drainage systems.
- 9.2.1.5. Several linear and curvilinear anomalies have been identified within this Zone and classified as 'Undetermined'. Some of these anomalies lack the contextual evidence needed to accurately classify them, and although they are likely modern, agricultural, or natural, an archaeological origin cannot be ruled out.

#### 9.2.2. Interpretation of Magnetic Results – Specific Anomalies

- 9.2.2.1. Agricultural (Strong/Spread) Along the eastern boundary of Area 3b.4, two perpendicular, strong linear anomalies enclose an area of discrete dipolar anomalies [3b.4.A] (Figure 77). The two linear anomalies match field boundaries seen on historical OS maps and the discrete dipolar anomalies likely represent features associated with the smithy, seen on the OS 1850s and 1880s historic map, and wooded features within this area.
- 9.2.2.2. Agricultural (Weak/Spread) Within Areas 3b.1, 3b.2, 3c.6 and 3c.7, several weak linear anomalies have been identified (Figures 74, 77, 80 and 83). Most of these anomalies align with field boundaries visible on historical OS mapping. Within Areas 3b.2 and 3c.6, some of these anomalies do not align with features visible on historical OS maps but present similar morphology and signal, thus likely being unmapped boundaries or footpaths. Within Area 3c.6, an area of weak dipolar anomalies has been identified which align with field boundaries visible on historical OS mapping (Figures 80). These spreads of magnetic material may be due to material from the former boundary being disturbed or dispersed by modern activity.
- 9.2.2.3. Agricultural (Trend) Weakly enhanced linear anomalies have been identified within Areas 3b.1, 3b.2, 3b.3 and 3c.7 running in multiple orientations (Figures 77 and 83). These anomalies are spread c. 4m apart and correlate with modern ploughing regimes visible in satellite imagery.
- 9.2.2.4. **Drainage Feature (Trend)** Across the majority of Zone 3, alignments of strong and weak parallel linear anomalies have been identified. The morphology and strengths of these anomalies are typical of field drainage systems.
- 9.2.2.5. **Ridge and Furrow** –Within Areas 3b.1, 3b.2, 3b.3, 3b.4, 3c.6, and 3c.8, parallel alignments of weak linear and curvilinear anomalies have been identified (Figures 74, 77, and 80). These anomalies are indicative of ridge and furrow ploughing regimes due to their morphology and the general 6-9m spacing between them, and often correlate with features previously identified in the Historic Environment Record.
- 9.2.2.6. Ferrous (Spread) (Pricket Hall) A spread of discrete dipolar anomalies [3c.6.A] has been identified within Area 3c.6 (Figure 80). These anomalies contain limited structural elements, and likely represent the presence of rubble from the former building of Pricket Hall, visible on historical mapping.
- 9.2.2.7. Ferrous (Spread) Large spreads of magnetic material are present across Areas 3a, 3b.2, 3b.3, 3c.1 and 3c.6 (Figures 74, 77, 80 and 83). These spreads are related to the use of green waste, and may partially obscure any other anomalies present within the data.
- 9.2.2.8. Undetermined (Strong) Along the western edge of 3b.3, several strong rectilinear anomalies with internal subdivisions have been identified [3b.3.A] (Figure 77). The outer rectangular formation of these anomalies covers an area c. 20m by c. 20m.

These anomalies do not correspond with any known features, but are in close proximity to a small, enclosed area on historical mapping. Although this feature does not correspond exactly with the small enclosure on historical mapping, it likely represents an area of post-medieval agricultural or structural development.

## 10. Reporting Zone 4

## 10.1. Geographic Background

- 10.1.1. Zone 4 comprises the cable connection corridor between Drax Power Station and the larger solar panel development area, covering an area of c. 57.5ha (Figure 1). The majority of the survey area was unable to be surveyed due to access constraints, high crop and livestock in the fields. Approximately 20.2ha was surveyed whilst c. 37.4ha was unable to surveyed. Zone 4 extends northeast from Drax Power Station, running parallel to the River Derwent, and the Selby to Hull Railway line.
- 10.1.2. Survey considerations:

Survey	Ground Conditions	Further Notes
Area		
4.1	Unable to be surveyed	
4.2	Unable to be surveyed	
4.3	Unable to be surveyed	
4.4	Unable to be surveyed	
4.5	Unable to be surveyed	
4.6	Unable to be surveyed	
4.7	Unable to be surveyed	
4.8	Unable to be surveyed	
4.9	Unable to be surveyed	
4.10	The survey area consisted of a	The survey area was bordered by a ditch to the
	flat arable field.	west and trees to the east. There was a barbed
		wire fence to the south and there was no
		physical boundary to the north.
4.11	The survey area consisted of a	The survey area was bordered by trees to the
	flat arable field.	west and by a ditch to the east. There was a
		barbed wire fence to the south and there was no
		physical boundary to the north.
4.12	The survey area consisted of a	The survey area was bordered by ditches to the
	flat arable field.	west and east, by barbed wire fencing to the
		south, and there was no physical boundary to
		the north. Pylons and overhead cables ran
		roughly north to south through the centre of the
4.10		survey area.
4.13	Unable to be surveyed	
4.14	Unable to be surveyed	
4.15	Unable to be surveyed	
4.16	Unable to be surveyed	
4.17	Unable to be surveyed	
4.18	Unable to be surveyed	
4.19	Ine survey area consisted of a	ine survey area was bordered by a drainage
	liat arable field.	ditch to the northwest and northeast, by a
		boundary to the south and there was no physical
		southwest
		southwest.

4.20	The survey area consisted of a	The survey area was bordered by hedgerow and
	flat arable field.	wooden wire fencing to the south, by wooden
		wire fencing to the east. There was no physical
		boundary to the north and west.
4.21	Unable to be surveyed	
4.22	Unable to be surveyed	
4.23	Unable to be surveyed	
4.24	Unable to be surveyed	
4.25	The survey area consisted of a	The survey area was bordered by hedgerow to
	flat arable field. A small area of	the east and west and no physical boundary to
	overgrown vegetation could not	the north and south. Overhead cables ran from
	be surveyed in the northwest.	north to south in the eastern half of the survey
	,	area.
4.26	The survey area consisted of a	The survey area was bordered by hedgerow to
	flat arable field with tall crop. A	the east and west, and no physical boundary to
	small area of overgrown	the north and south. Overhead cables ran from
	vegetation could not be	northwest to southeast across the northern
	surveyed in the northeast.	border of the survey area.
4.27	The survey area consisted of a	The survey area was bordered by hedgerow to
	flat pasture field in the east and	the east and west, and no physical boundary to
	a flat crop field in the west. The	the north and south.
	crop was tall and could not be	
	surveyed completely.	
4.28	Unable to be surveyed	
4.29	Unable to be surveyed	
4.30	The survey area consisted of a	The survey area was bordered by hedgerow to
	flat arable field.	the southwest and northeast, by a ditch to the
		southeast, and there was no physical boundary
		to the northwest.
4.31	The survey area consisted of a	The survey area was bordered by hedgerow, a
	flat pasture field.	ditch, and a wooden wire fence to the northeast
		and southeast. The survey area continued to the
		northwest and southwest.
4.32	Unable to be surveyed	
	(Livestock)	
4.33	The survey area consisted of a	The survey area was bordered by hedgerow and
	flat pasture field.	wooden wire fencing to the north and east. By
		intermittent trees and wooden wire fencing to
		the south. There was no physical boundary to
		the west.
4.34	The survey area consisted of a	The survey area was bordered by hedges, trees,
	flat arable field.	and metal fencing to the northeast, southeast
		and southwest. There was no physical boundary
		to the northwest.
4.35	The survey area consisted of a	The survey area was bordered by trees and
	flat pasture field.	hedges to the northeast, southwest and
		southeast. A metal fence was located in the
		southern corner of the field with a feeding
		through.
4.36	Unable to be surveyed	
	(Livestock)	

4.37	The survey area consisted of a flat arable field containing young crop.	The survey area was bordered by trees to the north and by hedgerow to the east. There was no physical boundary to the south. An overhead cable was identified in the centre of the survey area running in a northwest to southeast orientation.
4.38	The survey area consisted of a flat arable field containing young crop.	The survey area was bordered by trees to the east and south and by hedgerow to the west. There was no physical boundary to the north. An overhead cable was identified in the centre of the survey area running in a northwest to southeast orientation.

- 10.1.3. The underlying geology comprises sandstone of the Sherwood Sandstone Group in Areas 4.1-27, in Areas 4.28-38 the underlying geology comprises mudstone of the Mercia Mudstone Group. The superficial deposits comprise clay and silt of the Thorganby Clay Member in Areas 4.1-5, 4.18, 4.21-38. In Areas 4.6-17 and 4.19-20 the superficial deposits comprise clay, silt, sand, and gravel (British Geological Society, 2023).
- 10.1.4. The soils consist of slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils in Areas 4.1-6 and 4.22-38. In Areas 4.6-20 the soils consist of loamy and clayey soils of coastal flats with naturally high groundwater, in the north of Area 4.17 the soils consist of naturally wet very acid sandy and loamy soils. In the west of Area 4.18 the soils consist of loamy soils with naturally high groundwater (Soilscapes, 2023).

#### 10.2. Results

#### 10.2.1. Summary

- 10.2.2. A fluxgate gradiometer survey was completed across c. 20.2ha of the total c. 57.6ha survey area. The survey has responded well to the environment and has primarily detected anomalies of agricultural, natural, modern, and undetermined origins. Modern disturbance is predominantly limited to ferrous material in proximity to the Selby to Hull railway line that borders a section of the survey area.
- 10.2.3. Evidence of historical agricultural activity has been identified across the survey area in the form of former mapped field boundaries visible on historical OS maps, and linear trends likely relating to modern ploughing regimes. As with the rest of the region, several areas of drainage have also been identified.
- 10.2.4. Anomalies of natural origin have been detected in the south and centre of the survey area, and likely relate to alluvial material in the floodplain deposited by nearby watercourses.
- 10.2.5. Several linear and curvilinear anomalies have been classified as 'undetermined'. These anomalies lack the contextual evidence needed to confidently classify them, and although they are likely to be modern, agricultural, or natural, an archaeological origin cannot be ruled out.

#### 10.2.6. Interpretation of Magnetic Results – Specific Anomalies

- 10.2.6.1. **Undetermined (Strong and Weak)** A strong linear anomaly **[4.20.A]** has been identified running on a generally north-south orientation through Area 4.20 (Figure 92). The anomaly has both strongly positive and strongly negative components, and does not align with the mapped former field boundary that is visible in close proximity on historical mapping. The natural magnetic backgrounds of the areas to the west and east of this anomaly differ, suggesting that this feature separated the western area from the eastern area possibly containing floodwaters from the adjacent River Derwent to the east and preventing them reaching the western part of the area.
- 10.2.6.2. Natural (Weak and Spread) In Areas 4.10, 4.11, 4.12, 4.20, and 4.2,6 weakly enhanced and spreads of natural anomalies have been detected (Figure 92). These anomalies are likely related to alluvial deposition on the floodplains of nearby watercourses such as the River Derwent.
- 10.2.6.3. **Drainage Feature (Trend)** Across the majority of Zone 4, alignments of strong and weak parallel linear anomalies have been identified. The morphology and strengths of these anomalies are typical of field drainage systems.
- 10.2.6.4. **Undetermined (Weak)** Within Areas 4.20, 4.25, 4.27, 4.31, 4.33, and 4.34 linear and curvilinear anomalies have been identified. These anomalies lack the contextual evidence needed to accurately classify them, and although they are likely to be modern, agricultural, or natural, an archaeological origin cannot be ruled out.

## 11. Overall Discussion and Conclusions

- 11.1. A fluxgate gradiometer survey has successfully been undertaken across c. 1075.5ha of the main c. 1157.5ha solar panel site area, and c. 20.2ha of the total c.57.6ha connecting cable corridor. Where areas were unable to be surveyed due to access concerns, high crop in the summer months, were under stewardship schemes, or were de-scoped after project commencement.
- 11.2. The geophysical survey has detected anomalies of archaeological, agricultural, natural, and undetermined origins. The underlying geology has contributed to the enhancement of magnetic data with areas of magnetically enhanced clay, silt, and sand detected in areas adjacent to river courses or drainage ditches. Magnetic disturbance is limited across the site, and comprises mostly effects from overhead cables, gates in field entrances, the use of green waste as fertilizer, and magnetic haloes from buried services.
- 11.3. Three foci of archaeological activity were detected within the survey area. Several fragmentary enclosures and trackways have been identified on the north face of a slope that is present as a high point within the southeast of Zone 2. Further archaeological anomalies were located in this area that are likely related to the former Caville Hall. A final focus of archaeological activity is located in the central area of Zone 1, with several fragmentary anomalies present, including some that possibly indicate the presence of kilns.
- 11.4. Agricultural activity dominates the majority of the survey area, and evidences the extensive historical agricultural management of the area. Numerous areas of ridge and furrow regimes have been detected across the survey area, and numerous groupings of field drains are common in all zones. Several mapped and unmapped post-medieval field boundaries and footpaths have also been identified.
- 11.5. Several anomalies related to former farms or halls have been identified, including Brindcommon Farm in the centre of Zone 2, and Pricket Hall in Zone 3.
- 11.6. The survey area is extremely low lying and is located next to many large watercourses, including the River Derwent the River Ouse. Several areas contain a magnetic background that has been affected by alluvial material being deposited during flooding events.
- 11.7. Anomalies of an undetermined origin have been identified across the survey area. These are most likely to be agricultural, natural, or modern; however, an archaeological origin cannot be ruled out.

## 12. Archiving

- 12.1. MS maintains an in-house digital archive, which is based on Schmidt and Ernenwein (2013). This stores the collected measurements, minimally processed data, georeferenced and ungeoreferenced images, XY traces and a copy of the final report.
- 12.2. MS contributes reports to the ADS Grey Literature Library upon permission from the client, subject to the any dictated time embargoes.

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MS Job Code	MSSE1401			
Project Name	East Yorkshire Solar Farm			
Client	AECOM			
Grid Reference	SE 75923 33546			
Survey Techniques	Magnetometry			
Survey Size (ha)	1157.5ha (Solar Panel Area) & 57.6ha (Cable Connection)			
Survey Dates	12/09/22 – 02/06/23			
Project Lead	ject Lead Dr Chrys Harris MCIfA			
Project Officer	Jake Dolan BSc FGS			
HER Event No	TBC			
OASIS No	N/A			
S42 Licence No	N/A			
Report Version	1.0			

## 15. Project Metadata

## 16. Document History

Version	Comments	Author	Checked By	Date
0.1	Initial draft for Project Officer	AP IT CL	JD	24 July 2023
	to Review			
0.2	Corrections following Project	JD	PJ	31 July 2023
	Officer review			
0.3	Corrections following Project	JD	PJ	03 August
	Lead review			2023
1.0	Issued as Final	JD	-	11 October
				2023








































































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**magnitude** surveys














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431200	2g.4A			431200 -
MSSE1401 - East Yorkshire Solar Farm Figure 70 - Magnetic Interpretation (Area 2g.4) 1:1,500 @ A3 Copyright Magnitude Surveys Ltd 2023 Contains Ordnance Survey data © Crown Copyright and database right 2023	<ul> <li>Archaeology Probable (Strong)</li> <li>Undetermined (Weak)</li> <li>Archaeology Probable (Weak)</li> <li>Magnetic Disturbance</li> <li>Archaeology Possible (Weak)</li> <li>Agricultural (Trend)</li> <li>Agricultural (Weak)</li> <li>Service</li> <li>Undetermined (Strong)</li> <li>Ridge and Furrow (Trend)</li> </ul>	Drainage Feature     Data Artefact     Ferrous (Spike)	N 0 20 40 e	<sup>50 m</sup> magnitude s u r v e y s





















100 150 m

magnitude surveys

0

50

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MSSE1401 - East Yorkshire Solar Farm Figure 86 - XY Trace Plot (Area 3b.1 & 3b.3) 30nT/cm at 1:1,500 @ A3 Copyright Magnitude Surveys Ltd 2023 Contains Ordnance Survey data © Crown Copyright and database right 2023









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