Immingham Green Energy Terminal

TR030008

Volume 6

6.4 Environmental Statement Appendices

Appendix 14.H: Report on Geophysical Survey

Planning Act 2008

Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

September 2023

Infrastructure Planning

Planning Act 2008

The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 (as amended)

Immingham Green Energy Terminal

Development Consent Order 2023

6.4 Environmental Statement Appendices Appendix 14.H: Report on Geophysical Survey

Regulation Reference	APFP Regulation 5(2)(a)
Planning Inspectorate Case Reference	TR030008
Application Document Reference	TR030008/APP/6.4
Author	Associated British Ports Air Product BR

Version	Date	Status of Version
Revision 1	21 September 2023	DCO Application

NH3 Immingham Archaeological Works
Immingham, Lincolnshire

Detailed Gradiometer Survey Report

Accession Number: GRIMS:2022.023
Document Ref: 271002.03
Feb 2023

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Document Information

Document title	NH3 Immingham Archaeological Works - Immingham, Lincolnshire
Document subtitle	Detailed Gradiometer Survey Report
Document reference	271002.03
Commissioned by	AECOM
Address	5th Floor 2 City Walk Leeds West Yorkshire LS11 9AR
Site location	Laporte Road, Immingham, Grimsby
County	Lincolnshire
National grid reference	521234 415283 (TA 21234 15285)
Planning authority	North East Lincolnshire Council
Museum name	North East Lincolnshire Museums Services
Museum accession code	GRIMS:2022.023
WA project name	NH3 Immingham Archaeological Works - Immingham, Lincolnshire
WA project code	271002
Dates of fieldwork	06/02/2023 – 07/02/2023
Fieldwork directed by	Jo Instone-Brewer
Project management by	Tom Richardson
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Quality Assurance

Issue	Date	Author	Approved by
1	16/02/2023	LJ	[redacted] TR
2	02/03/2023	LJ	TR

Contents

List of Figures

Summary

A detailed gradiometer survey was conducted over a parcel of land in Immingham, Lincolnshire (centred on NGR 521234 415285). The project was commissioned by AECOM as part of a staged approach in determining the archaeological potential of the site.

The site comprises an arable field located south-east of Immingham Docks, 2.3 km east of the town of Immingham, covering an area of 10.9 ha (**Figure 1**). The geophysical survey was undertaken on 06 – 07 January 2023. The detailed gradiometer survey has not identified any anomalies that can confidently be interpreted as archaeology. However several possible archaeological anomalies have been identified across the site

Several large linear features and one rectilinear feature have been identified. It is possible these relate to WWII defensive features however other origins such as archaeological or more modern land management and/or drainage features cannot be entirely ruled out. One linear feature, based on location, may be related to the use of a beacon recorded as having been immediately outside the eastern boundary of the site.

Two smaller curvilinear features were identified in the west of the site with the potential to relate to archaeological ditched features. However, a natural origin cannot be ruled out.

Strong geological responses reflecting the intertidal environment and alluvial processes have been identified across the site. This is most strong in the southern half of the site, with some channels crossing the northern half. The northern half of the site exhibits fewer natural variations, but more ferrous responses indicating the two sections may have undergone slightly different formation processes, potentially the northern area having been used agriculturally for a longer period of time.

Two large ferrous responses have been identified that likely relate to modern activity. However it is possible that they relate to a bomb crater recorded in the area.

The remaining anomalies are thought to be modern, relating to services, drains and field boundaries.

Acknowledgements

Wessex Archaeology would like to thank AECOM for commissioning the geophysical survey. The assistance of David Rosenberg is gratefully acknowledged in this regard.

The fieldwork was undertaken by Joanne Instone-Brewer and Zhaxi Luobu. Brett Howard processed geophysical data. Lydia Jones interpreted the geophysical data, wrote the report, and prepared the illustrations. The geophysical work was quality controlled by Tom Richardson. The project was managed on behalf of Wessex Archaeology by Tom Richardson.

NH3 Immingham Archaeological Works Immingham, Lincolnshire

Detailed Gradiometer Survey Report

1 INTRODUCTION

1.1 Project background

1.1.1 Wessex Archaeology was commissioned by AECOM to carry out a geophysical survey at Immingham, Lincolnshire (centred on NGR 521234 415283) (**Figure 1**). The survey forms part of a staged approach in determining the archaeological potential of the site and follows other non-intrusive archaeological work.

1.2 Scope of document

1.2.1 This report presents a brief description of the methodology followed by the detailed survey results and the archaeological interpretation of the geophysical data.

1.3 The site

1.3.1 The site is located 3.2 km east of the village of Immingham and 7.8 km north-west of Grimsby in the county of Lincolnshire.

1.3.2 The survey comprises 10.9 ha of agricultural land, currently utilised for arable. The site is bounded by the River Humber to the north-east and east, a strip of woodland to the north, an industrial facility and North Beck Drain to the south, and Laporte Road to the west.

1.3.3 The site is relatively flat with a mildly undulating topography between 2 – 5 m above Ordnance Datum (aOD) throughout.

1.3.4 The solid geology comprises sedimentary chalks of the Flamborough Chalk Formation, shallow marine in origin, with overlaying superficial geological deposits of Tidal Flat clays and silts formed in intertidal zones (BGS 2023).

1.3.5 The soils underlying the site are likely to consist of quaternary marine argillic-arenaceous clay-silt, a layered subsoil of clay, silt, and sand (BGS 2023). Soils derived from such geological parent material have been shown to produce magnetic contrasts acceptable for the detection of archaeological remains through magnetometer survey.

2 ARCHAEOLOGICAL BACKGROUND

2.1 Introduction

2.1.1 The archaeological and historical background was assessed in a prior desk-based assessment (AECOM 2022), which considered the recorded historic environment resource within a 2 km study area. A summary of the results is presented below, with the relevant entry numbers from the Lincolnshire Historic Environment Record (HER) and the National Heritage List for England (NHLE) included. Additional sources of information are referenced, as appropriate.

2.2 Summary of the archaeological resource

2.2.1 There are no designated heritage assets within the site. There is one Grade II listed building within the wider study area.

2.2.2 The Grade II listed War Memorial (NHLE: 1455139) is located 2 km west of the site. The memorial was erected in 1925 for the fallen soldier of the First World War and was later adjusted to include fallen soldiers from the Second World War.

2.2.1 Several non-designated heritage assets have been identified within the site. A drain and flood defence, along with an associated beacon that sits immediately outside the site boundary, are recorded in the east and south-east on the historical OS mapping from 1907 (**Figure 4**). A WWII bomb crater is documented as being within the site (MNL4643) having been identified via aerial photography.

Prehistoric (– AD 43)

2.2.2 The earliest evidence of prehistoric date is a pair of ditches found containing flintwork of Neolithic or Bronze Age origin and may have been associated with a trackway.

2.2.3 An antler pick of uncertain prehistoric date was found within the Humber in a submerged forest bed during the construction of Immingham Dock (MNL845), 1.8 km north of the site.

Roman (AD 43 – 410)

2.2.4 At the Stallingborough Interchange, a high-status Roman settlement and industrial site has been recorded 1.3 km south of the site (see archaeological works below). Undated cropmarks of rectangular ditched enclosures could form part of the Roman landscape (MNL4607).

Medieval (AD 410 – 1540)

2.2.5 A few salturn sites (salt making) have been identified in and around Stallingborough, Immingham, and Habrough Marsh, though only the latter lies within the study area, located 1.6 km north-west of the site (MNL273). It was controlled by Newhouse (Newsham) Priory and is mentioned in the 1086 *Domesday*.

2.2.6 A possible deserted medieval settlement near Mauxhall Farm, 2 km south-west of site, is visible on aerial photography, including ridge and furrow cultivation features, trackways, and possible building platforms (MNL326). Ridge and furrow are recorded at Stallingborough, spreading from 2.6 km to 1.9 km south of the site. Alluvial layers show that the site was prone to flooding and was perhaps farmed rather than inhabited.

Post Medieval (AD 1540 – 1900)

2.2.7 Aerial photography has recorded the remains of post-medieval field boundaries and narrow ridge and furrow cultivation features at Harborough Marsh 500 m to the north-west of the site. They also recorded the presence of either singular or a series of drainage ditches 0.7 km north-west of the site at an inlet at Habrough Marsh known as Nun's Creek (MNL4269), which was connected with the Cistercian nunnery at Coatham (also known as Coatham deserted medieval village) from at least 1250 – 60. The nunnery was dissolved in 1539 and the site redeveloped as a village with a moated manor. Nun's Creek has a post-medieval sluice-gate and drainage ditch, presumably built upon previous drainage architecture.

2.2.8 Historical OS maps reveal several woodland features, osier (willow plantation) and a blow well at Stallingborough to the south. Additionally, the historic maps reveal a series of post-medieval roads and trackways which may have their origins in the medieval period: North Moss Lane, Kiln Lane, and Laporte Road, amongst others. Within the site itself OS mapping from 1907 shows a drain and flood defence roughly following the line of North Beck Drain but within the south-eastern part of the site itself. A beacon is also recorded along this in

the 1907 (**Figure 4**) and subsequent mapping, however this has disappeared by the 1953 OS map.

2.2.9 Together with OS historical maps the aerial photographs record historical flood defences across the study area, including at Immingham, Kiln Lane Trading Estate, and at Harborough Marsh. Features associated with costal navigation and transportation (e.g., Stallingborough Ferry) are visible on the historical map alongside several buildings predating the docks.

2.2.10 The construction of Immingham Docks, 1.5 km to the north of the site, was completed in 1912 (began in 1906) and established by the Humber Commercial Railway and Dock Company in association with the Great Central Railway. During its construction, corrugated tin huts, known as Tin Town, were raised as temporary settlement for the workers. A coaling stage and a grain store are associated with historic development and operation of the docks. In addition, there are several records relating to the use and expansion of the transportation infrastructure associated with the dock and port at Immingham. The dock was a submarine base for British D-class submarines during the World War I and later used for cruise ships in the 1930s.

Modern (1901 – present)

2.2.11 A WWII bomb crater is documented as being within the site (MNL4643) having been identified via aerial photography in 1941.

2.2.12 Ten ships have been documented stranded or wrecked against the shore adjacent to the site, dating between 1810 and 1920. Two crafts, a 1915 Norwegian schooner the *Hvitveis* was shown as a wreck in situ with digital bathymetric data in 2008 (United Kingdom Hydrographic Office (UNHO) wreck report 8507), and an unidentified craft was last seen in 2004, though it is now thought to be fully dispersed.

2.2.13 The entrance to the Humber adopted a number of defences during the first and second World Wars, some of which were, and still are, located within the research area. In the field 80 m to the west of the site perpendicular lines of anti-landing obstacles visible as earthworks (MNL4632) were identified from aerial photography. They have since been levelled. A heavy anti-aircraft battery (Humber H21) was situated 300 m north-west of the survey site, listed as unarmed in 1941.The remains of Stallingborough Battery, located 1.5 km south-east of the site, opened in 1915, and a World War I pillbox can be seen. The battery was disarmed between 1943 – 1945.

2.2.14 Historical OS mapping shows the site used to be one larger field continuing to the south-west until meeting the old electric tram line but was bisected by the construction of Laporte Road *c.*1950.

Undated

2.2.15 Undated cropmark sites are recorded on the HER, including areas of enclosures or natural features, a possible prehistoric ring ditch, and linear features south of Kiln Lane (2.1 km south of site). A geological borehole alongside North Beck drain, located 600 m south of site, revealed undated peat deposits. Peat is especially good at preserving organic matter.

2.3 Previous archaeological works

2.3.1 In 1997 a gradiometer survey conducted for the construction of the adjacent South Humber Bank Power Station 1.3 km south of the site identified some potential Roman industrial activity in the form of kilns, and some undatable earthworks including a ditch, a field boundary, and a field drain (WYAS 1997).

2.3.2 In 2005 a watching brief conducted for the C.A.T.C.H Project, Immingham identified an undated drainage ditch 1 km SSE of the site (Pullen 2005).

2.3.3 In 2010 evaluation trenches following a geophysical survey (2009) for the construction of the Heron Renewable Energy Plant 1.5 km north-west of the site identified finds from Early Bronze Age through to Roman, including an Iron Age bone awl and pottery from across the eras, as well as an Early Bronze Age ring ditch, occupation site, and salt production site (Stronach 2010).

3 METHODOLOGY

3.1 Introduction

3.1.1 The geophysical survey was undertaken by Wessex Archaeology's in-house geophysics team on 6 and 7 February 2023. Field conditions at the time of the survey were dry throughout. An overall coverage of 10.7 ha was achieved. 0.2 ha was unable to be collected due to a steep ditch to the north of the site.

3.1.2 The methods and standards employed throughout the geophysical survey conform to current best practice, and guidance outlined by the Chartered Institute for Archaeologists' (CIfA 2014) and European Archaeologiae Consilium (Schmidt *et al.* 2015).

3.2 Aims and objectives

3.2.1 The aims of the survey comprise the following:

- To determine, as far as is reasonably possible, the nature of the detectable archaeological resource within a specified area using appropriate methods and practices; and
- To inform either the scope and nature of any further archaeological work that may be required; or the formation of a mitigation strategy (to offset the impact of the development on the archaeological resource); or a management strategy.

3.2.2 In order to achieve the above aims, the objectives of the geophysical survey are:

- To conduct a geophysical survey covering as much of the specified area as possible, allowing for on-site obstructions;
- To clarify the presence/absence of anomalies of archaeological potential; and
- Where possible, to determine the general nature of any anomalies of archaeological potential.

3.3 Fieldwork methodology

3.3.1 The cart-based gradiometer system used a Carlson BRX7 instrument, which receives corrections from a network of reference stations operated by the Ordnance Survey (OS). Such instruments allow positions to be determined with a precision of 0.02 m in real-time and therefore exceeds European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015).

3.3.2 The detailed gradiometer survey was undertaken using four SenSys FGM650/3 gradiometers spaced at 1 m intervals and mounted on a non-magnetic cart. Data were collected with an effective sensitivity of 0.03 nT at a rate of 10 Hz, producing intervals of 0.15 m along transects spaced 4 m apart.

3.4 Data processing

3.4.1 Data from the survey were subjected to minimal correction processes. These comprise a 'Destripe' function (±5 nT thresholds), applied to correct for any variation between the sensors, and an interpolation used to grid the data and discard overlaps where transects have been collected too close together.

3.4.2 Further details of the geophysical and survey equipment, methods and processing are described in **Appendix 1**.

4 GEOPHYSICAL SURVEY RESULTS AND INTERPRETATION

4.1 Introduction

4.1.1 The detailed gradiometer survey has identified magnetic anomalies across the site, suggestive of possible archaeological features, natural variations in the underlying deposits, drains, possible agricultural activity, buried services, and magnetic disturbance. Results are presented as a series of greyscale plots and archaeological interpretations at a scale of 1:2,000 (**Figures 3 & 4**). The data are displayed at -2 nT (white) to +3 nT (black) for the greyscale image (**Figure 2**).

4.1.2 The interpretation of the datasets highlights the presence of possible archaeological anomalies, ferrous responses, natural variations, and magnetic trends (**Figures 3 & 4**). Full definitions of the interpretation terms used in this report are provided in **Appendix 2**.

4.1.3 Numerous ferrous anomalies are visible throughout the dataset. These are presumed to be modern in provenance and are not referred to, unless considered relevant to the archaeological interpretation.

4.1.4 It should be noted that small, weakly magnetised features may produce responses that are below the detection threshold of magnetometers. It may therefore be the case that more archaeological features may be present than have been identified through geophysical survey.

4.1.5 Gradiometer survey may not detect all services present on site. This report and accompanying illustrations should not be used as the sole source for service locations and appropriate equipment (e.g., CAT and Genny) should be used to confirm the location of buried services before any trenches are opened on site.

4.2 Gradiometer survey results and interpretation

4.2.1 The geophysical survey has identified a number of features that have the potential to be associated with archaeological remains. These are located across the site, and are associated with large linear and rectilinear features, as well as curvilinear ditched features.

4.2.2 Oriented north-west to south-east crossing the south of the site is a strong linear anomaly at **4000**. It is 248 m long and generally between 7 – 10 m wide but expanding up to 14 m wide at its northern end. It has a mainly negative signal with a narrower positive magnetic signal at its edges, indicative of a bank with ditches on either side. Branching off to the south-west of this anomaly, and exhibiting the same magnetic signal, is a 7 m wide linear anomaly which forms a 50 m x 45 m rectangular anomaly at **4001**. Its overall shape and size is typical of an enclosure, with the long linear anomaly at **4000** forming its north-eastern edge. However, the signal of these anomalies is similar to some of the geological responses detected, where it is likely alluvial action has removed more enhanced soil and left a channel behind. The linear anomaly at **4000** also terminates at its eastern end in two much narrower linear drain-like features (**4008**) which lead into North Beck Drain. It is possible these anomalies are related to archaeological activity, potentially either for land/water

management or related to WWII defences. However given their size and strength of response a more modern origin relating to drainage cannot be entirely ruled out.

4.2.3 Several linear and curvilinear anomalies have been detected in the north-east at **4002** – **4004** and south-east at **4005** – **4006**, which have some potential to relate to archaeological activity. However the strong geological responses in the area make more confident interpretation difficult.

4.2.4 In the north-east of the site a 3 – 6 m wide by 170 m long linear anomaly has been detected at **4002**, oriented north-east to south-west. It has a mainly strong negative signal with a narrower positive magnetic signal at its edges similar, although slightly weaker, than at **4000**. The eastern terminus of the feature is close to where a 'Beacon' is recorded on the 1907 OS mapping (**Figure 4**). Halfway along **4002** a positive linear anomaly measuring 30 m long branches off at a 90-degree angle oriented north. This is in the same orientation, and has the same positive signal, as a smaller (21 m in length) positive anomaly at **4003** detected in the northern corner of the site. This may be a continuation of **4002**. 9 m to the south of **4002** a weak linear anomaly has been detected at **4004**. This is 67 m long and 5 m wid. It has the same negative signal with narrower positive signal at its edges. These anomalies are all indicative of bank features with associated ditches, possibly associated with former land division and/or drainage ditches or related to WWII defensive structures. The anomaly at **4002** may be an unrecorded trackway supporting the use of the beacon. However, a more modern origin relating to water management channels cannot be ruled out.

4.2.5 In the south-west of the site two weak positive curvilinear anomalies, one measuring 67 m long by 3 m wide at **4005** and another measuring 37 m long by 4 m wide at **4006** have been detected. Their magnetic signal is typical of ditched features infilled with a more magnetic soil and they have the potential to be archaeological in origin. However given their position in an area of strong geological response they may equally be related to natural variations in the subsoil.

4.2.6 The southern half of the site exhibits a background of strongly enhanced sinuous and amorphous positive and negative anomalies. These have most likely been caused by alluvial inter-tidal processes, namely the movement and deposition of clays, silts, and sands including the creation of channels in these as well as the underlying chalk. The northern half of the site has a much less enhanced natural background, although some of the sinuous channel features do extend into this area, particularly in the north-east. Whilst it has less natural variations, the northern half of the site has more small ferrous responses as a fairly even spread. It may be that this area of land was not subject to the same flooding or tidal processes. Alternatively it may have been used as agricultural land for longer, and so has developed a thicker deposit created by human activity and therefore masks the underlying natural variations.

4.2.7 Narrow linear strong positive anomalies have been detected across the site on various orientations. These form a series of land drains which feed into each other and ultimately into larger drains. Two parallel curvilinear drains have been detected running along the eastern boundary of the site following the curve of North Beck Drain at **4007**. These are in the same location as a flood defence and drain depicted in the 1907 OS mapping (**Figure 4**). Two weakly positive parallel linear anomalies at **4008**, spaced 5.8 m apart, have been detected in the south-east corner of the site. These lead from the possible boundary feature at **4000** towards North Beck Drain. Given their magnetic signal, morphology and location they are considered likely to be drains.

4.2.8 Numerous narrow ferrous and weakly positive linear trends have been detected in the north of the site. These are considered likely to either be the remains of older drainage regimes

or related to agricultural activity such as ploughing. Given their weak signal and strongly enhanced surroundings it is not possible to provide a more definite origin.

4.2.9 Along the north-west boundary of the site are a dipolar linear anomaly at **4009**, and strongly positive linear anomaly at **4010**. These are indicative of modern services.

4.2.10 Two large areas of magnetic disturbance have been detected on the north-western boundary at **4011** and in the east of the site at **4012**. These anomalies are consistent with large ferrous objects. The anomaly at **4012** is located at the terminus of one of the curving drains (**4007**) and the historical flood defences, and may be related to these. A bomb crater is recorded within the site, although the exact location is not recorded this origin cannot be ruled out.

4.2.11 Areas of ferrous response are seen along the field boundaries. These responses are likely caused by fencing and the industrial unit to the south.

5 DISCUSSION

5.1 Results

5.1.1 The detailed gradiometer survey has not identified any anomalies that can confidently be interpreted as archaeology. However several possible archaeological anomalies have been identified across the site.

5.1.2 Several large linear features and one rectilinear feature have been identified. Given the known features in the surrounding area it is possible these relate to WWII defensive features, however other origins such as archaeological or more modern land management and/or drainage features cannot be entirely ruled out. One linear feature, based on location, may be related to the use of a beacon recorded as having been immediately outside the eastern boundary of the site.

5.1.3 Two smaller curvilinear features have been identified in the west of the site with the potential to relate to archaeological ditched features. However, given their location and weaker signal a natural origin cannot be ruled out.

5.1.4 Strong geological responses reflecting the intertidal environment and alluvial processes have been identified across the site. This is most strong in the southern half of the site, with some channels crossing the northern half. The northern half of the site exhibits less natural variations, but more ferrous responses indicating the two sections may have undergone slightly different formation processes, potentially the northern area having been used agriculturally for a longer period of time.

5.1.5 Numerous magnetic trends have been identified in the north of the site, these may relate to older drainage schemes or past agricultural activity.

5.1.6 Two large ferrous responses have been identified that likely relate to modern activity. However it is possible that they relate to a bomb crater recorded in the area.

5.1.7 The remaining anomalies are thought to be modern, relating to services, drains and field boundaries.

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APPENDICES

Appendix 1 Survey equipment and data processing

Survey methods and equipment

The magnetic data for this project were acquired using a non-magnetic cart fitted with four SenSys FGM650/3 magnetic gradiometers. The instrument has four sensor assemblies fixed horizontally 1 m apart allowing four traverses to be recorded simultaneously. Each sensor contains two fluxgate magnetometers arranged vertically with a 0.6 m separation and measures the difference between the vertical components of the total magnetic field within each sensor array. This arrangement of magnetometers suppresses any diurnal or low frequency effects.

The gradiometers have an effective resolution of ±8 µT over ±1000 nT range. All of the data are then relayed to a CS35 tablet, running the MONMX program, which is used to record the survey data from the array of FMG650/3 probes at a rate of 20 Hz. The program also receives measurements from a GPS system, which is fixed to the cart at a measured distance from the sensors, providing real time locational data for each data point.

The cart-based system relies upon accurate GPS location data which is collected using a Carlson BRX7. This receives corrections from a network of reference stations operated by the Ordnance Survey, allowing positions to be determined with a precision of 0.02m in real-time and therefore exceed the level of accuracy recommended by European Archaeologiae Consilium recommendations (Schmidt *et al.* 2015) for geophysical surveys.

Data may be collected with a higher sample density where complex archaeological anomalies are encountered, to aid the detection and characterisation of small and ephemeral features. Data may be collected at up to 0.01 m intervals along traverses spaced up to 0.25m apart.

Post-processing

The magnetic data collected during the survey is downloaded from the system for processing and analysis using both commercial and in-house software. This software allows for both the data and the images to be processed in order to enhance the results for analysis; however, it should be noted that minimal data processing is conducted so as not to distort the anomalies.

Typical data and image processing steps may include:

- GPS DeStripe – Determines the median of each transect and then subtracts that value from each datapoint in the transect within the defined window. May be used to remove the striping effect seen within a survey caused by directional effects, drift, etc.

- Discard Overlaps - Intended to eliminate a track(s) that have been collected too close to one another. Without this, the results of the interpolation process can be distorted as it tries to accommodate very close points with potentially differing values.

- GPS Base Interpolation – Sets the X & Y interval of the interpolated data and the track radius (area around each datapoint that is included in the interpolated result).

Typical displays of the data used during processing and analysis:

- Greyscale – Presents the data in plan view using a greyscale to indicate the relative strength of the signal at each measurement point. These plots can be produced in colour to highlight certain features but generally greyscale plots are used during analysis of the data.

- XY Plot – Presents the data as a trace or graph line for each traverse. Each traverse is displaced down the image to produce a stacked profile effect. This type of image is useful as it shows the full range of individual anomalies.

Appendix 2 Geophysical interpretation

The interpretation methodology used by Wessex Archaeology separates the anomalies into four main categories: archaeological, modern, agricultural, and uncertain origin/geological.

The archaeological category is used for features when the form, nature and pattern of the anomaly are indicative of archaeological material. Further sources of information such as aerial photographs may also have been incorporated in providing the final interpretation. This category is further sub-divided into three groups, implying a decreasing level of confidence:

- Archaeology – used when there is a clear geophysical response and anthropogenic pattern.
- Possible archaeology – used for features which give a response, but which form no discernible pattern or trend.

The modern category is used for anomalies that are presumed to be relatively modern in date:

- Ferrous – used for responses caused by ferrous material. These anomalies are likely to be of modern origin.
- Modern service – used for responses considered relating to cables and pipes; most are composed of ferrous/ceramic material although services made from non-magnetic material can sometimes be observed.

The agricultural category is used for the following:

- Former field boundaries – used for ditch sections that correspond to the position of boundaries marked on earlier mapping.
- Ridge and furrow – used for broad and diffuse linear anomalies that are considered to indicate areas of former ridge and furrow.
- Ploughing – used for well-defined narrow linear responses, usually aligned parallel to existing field boundaries.
- Drainage – used to define the course of ceramic field drains that are visible in the data as a series of repeating bipolar (black and white) responses.

The uncertain origin/geological category is used for features when the form, nature and pattern of the anomaly are not sufficient to warrant a classification as an archaeological feature. This category is further sub-divided into:

- Increased magnetic response – used for areas dominated by indistinct anomalies which may have some archaeological potential.
- Trend – used for low amplitude or indistinct linear anomalies.
- Superficial geology – used for diffuse edged spreads considered to relate to shallow geological deposits. They can be distinguished as areas of positive, negative, or broad bipolar (positive and negative) anomalies.

Appendix 3 OASIS form

Project Details:

Project name		NH3 Immingham Archaeological Works, Immingham, Lincolnshire			
Type of project		Detailed gradiometer survey			
Project description		Several possible archaeological linear and anomalies have been identified across the site. Given the known features in the surrounding area and the strength of the signal it is possible these relate to WWII defensive features however other origins such as archaeological or more modern land management and/or drainage features cannot be entirely ruled out. One linear feature, based on location, may be related to the use of a beacon recorded as having been just outside the eastern boundary of the site. Two smaller curvilinear features were identified in the west of the site with the potential to relate to archaeological ditched features. However a natural origin cannot be ruled out. Strong responses reflecting the intertidal environment and alluvial processes have been identified across the site. This is strongest in the southern half of the site, with some channels crossing the northern half. The northern half of the site exhibits less natural variations, but more ferrous responses indicating the two sections may have undergone slightly different formation processes, potentially the northern area having been used agriculturally for a longer period of time. Two larger areas of increased magnetic response are apparent within the site. Modern origins are expected for these, with the one in the south potentially being related to the previous flood defences, or a previously recorded bomb crater. Numerous trends have been identified in the north of the site, these may relate to older drainage schemes or past agricultural activity. The remaining anomalies are thought to be modern including services, drains and field boundaries.			
Project dates		**Start:** 06-02-2023		**End:** 07-02-2023	
Previous work		DBA			
Future work		Unknown			
Project Code:	PN271002	**HER event no.**	N/A	**OASIS form ID:**	wessexar1-513247
		NMR no.	N/A		
		SM no.	N/A		
Planning Application Ref.		N/A			
Site Status		None			
Land use		Agricultural			
Monument type		N/A	**Period**	N/A	

Project Location:

Site Address	Laporte Road, Immingham, Grimsby			**Postcode**	DN40 1QT
County	Lincolnshire	**District**	NE Lincolnshire	**Parish**	Immingham
Study Area	10.9 ha	**Height OD**	2 - 5 m aOD	**NGR**	TA 21234 15285

Project Creators:

Name of Organisation	Wessex Archaeology		
Project brief originator	Aecom Ltd.	**Project design originator**	Aecom Ltd.
Project Manager	Tom Richardson	**Project Supervisor**	Jo Instone-Brewer
Sponsor or funding body	Aecom Ltd.	**Type of Sponsor**	Private

Project Archive and Bibliography:

Physical archive	N/A	**Digital Archive**	Geophysical survey and report	**Paper Archive**	N/A
Report title	NH3 Immingham Archaeological Works, Immingham, Lincolnshire			**Date**	2018
Author	Wessex Archaeology	**Description**	Unpublished report	**Report ref.**	PN271002.03

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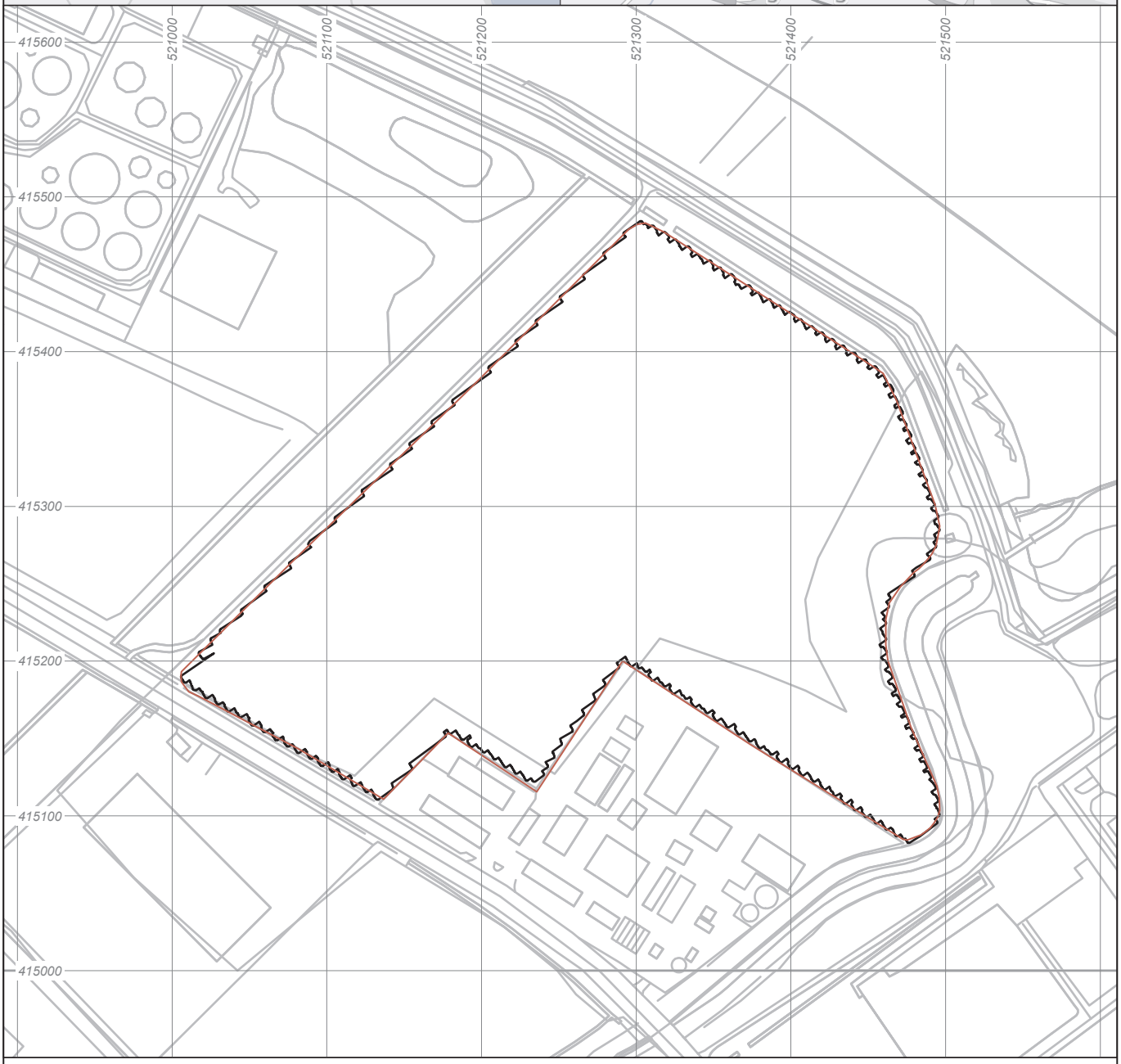

Date: 17/02/2023	Created by: LJ	Revision: 2	Scale: 1:4,000 at A4

Figure 1: Site location and survey extents

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521000

521200

521400

415400

415200

Site boundary

Detailed survey extent

-2 nT 3 nT

0 100 m

Date: 17/02/2023	Created by: LJ	
Scale: 1:2,000 at A3	Revision: 2	

Figure 2: Detailed gradiometer survey greyscale plot

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521000
521200
521400
415400
415200

4003
4011
4002
4009
4004
4012
4001
4000
4007
4010
4006
4008
4005

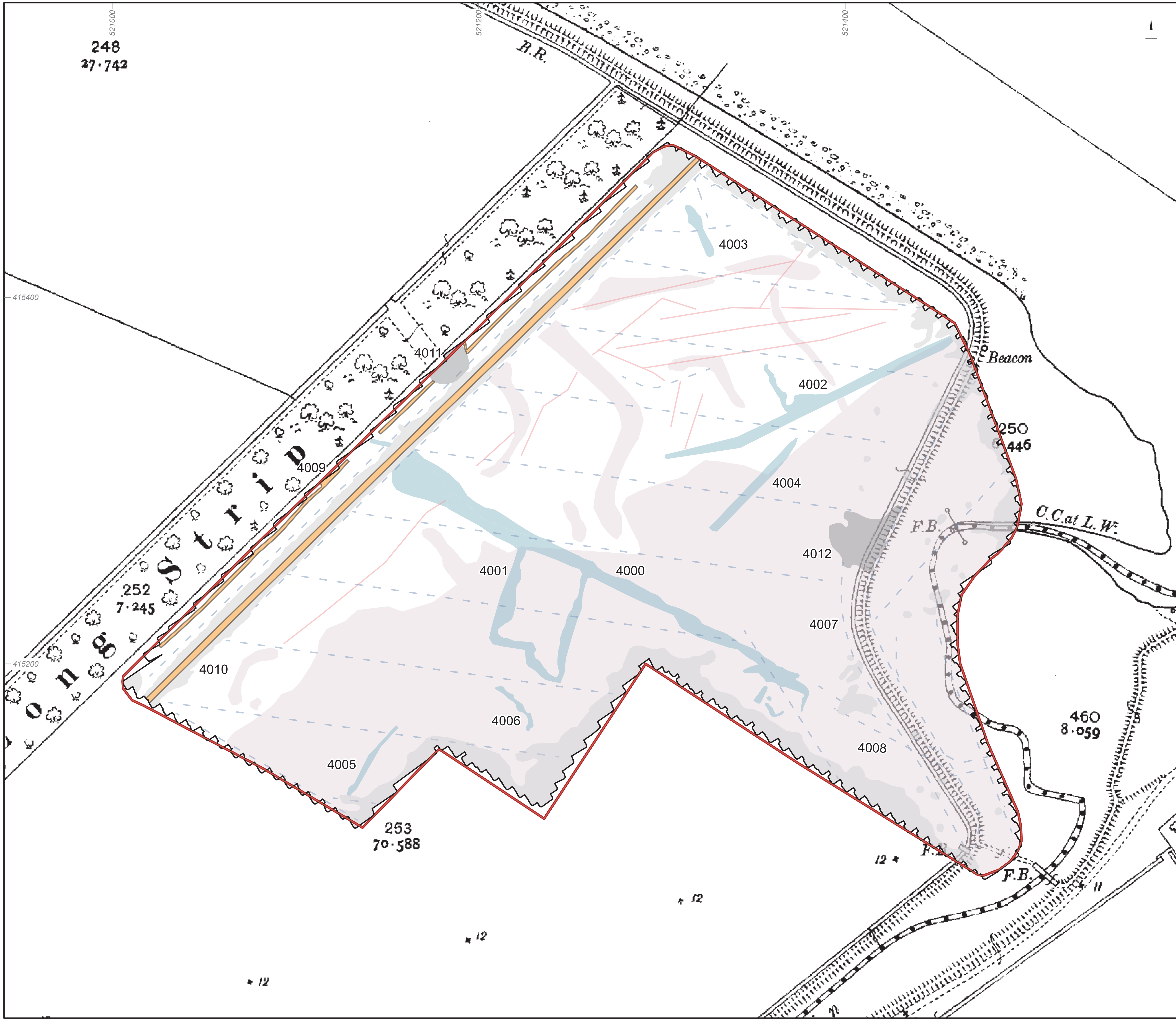
- Site boundary
- Detailed survey extent
- Possible archaeology
- Geology
- Increased response
- Modern service
- Ferrous
- Drain
- Trend

0 100 m

Date: 17/02/2023 | Created by: LJ

Scale: 1:2,000 at A3 | Revision: 2

Figure 3: Detailed gradiometer interpretation



- Site boundary
- Detailed survey extent
- Possible archaeology
- Geology
- Increased response
- Modern service
- Ferrous
- Drain
- Trend

0 100 m

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Coordinate system: OSGB 1936 British National Grid

Date: 02/03/2023	Created by: LJ
Scale: 1:2,000 at A3	Revision: 0

Figure 4: Interpretation and historical OS mapping (Lincolnshire, 1907, Survey Scale: 1:2,500)

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