

Great Linford Manor Park, Milton Keynes

Archaeological Geophysical Survey

National Grid Reference Number: SP 85195 42384

AOC Project No: 51744

Date: June 2017



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Archaeological Geophysical Survey

On Behalf of:	Cotswold Archaeology 41 Burners Lane South Kiln Farm Milton Keynes MK11 3HA
National Grid Reference (NGR):	SP 85195 42384
AOC Project No:	51744
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This document has been prepared in accordance with AOC standard operating procedures.

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Non-Technical Summary

AOC Archaeology Group was commissioned by Cotswold Archaeology on behalf of The Parks Trust to undertake an archaeological geophysical survey, consisting of both Earth Resistance and Gradiometer, to investigate the potential for buried archaeological remains in the Great Linford Manor Park, Milton Keynes (centred at SP 85195 42384). A total of approximately 3.38 hectares were surveyed and the results of the survey have identified the following.

Both the Gradiometer and Earth Resistance surveys identified the location of the former historic Linford Doric Seat in the north-east of the grounds, identified from a positive and negative anomaly in the Gradiometer data and a high resistance area surrounding a low resistance area in the Earth Resistance data.

The location of a potential former sun dial was confirmed through the Earth Resistance survey, though this is not recorded in the HER data.

A former field boundary was located in the south of the survey area and its location has been confirmed through historic mapping. A further possible field boundary was identified in the north-east of the data, though this could also be an anomaly relating to landscaping and terracing of the gardens, such as a further Ha-Ha.

A number of features, consisting of areas and linear anomalies of magnetic disturbance, as well as high and low resistance were recorded in the data which relate to either historic garden landscaping or modern activity.

1 Introduction

- 1.1 AOC Archaeology Group was commissioned by Cotswold Archaeology on behalf of The Parks Trust to undertake an archaeological geophysical survey of Great Linford Manor Park, Milton Keynes, as part of a research study associated with the former layout of the park and the history of the site.
- 1.2 The survey was carried out to help identify the location, extent, survival and significance of any heritage assets within the site boundary. In particular, the survey was required to ascertain the potential location of buried garden features on the site, any associated buildings located close to the historic Doric Seat and any possible remains related to the historic village and manor at Great Linford.

2 Site Location and Description

- 2.1 The proposed research area is located within the grounds of Great Linford Manor Park, Milton Keynes and is centred on SP 85195 42384 (see Figure 1). The site is bounded to the north by the Grand Union Canal and to the east, south and west by roads and gardens associated with Great Linford Manor.
- 2.2 The survey area covers approximately 3.38 hectares (ha); the majority of which consists of landscaped grounds associated with the manor's parkland. The survey area is generally level at an average height of around 77m aOD (above Ordnance Datum).
- 2.3 Areas of the park in the north-east were not able to be surveyed due to dense vegetation and woodland, as well as further obstructions from park features in the north such as ponds and walls.
- 2.4 The bedrock recorded geology within the proposed survey area consists of limestone and clay of the Blisworth formation (BGS 2017). This is overlain by lime-rich loamy and clayey soils with impeded drainage (Soilscapes 2017).

3 Archaeological Background

- 3.1 The archaeological background below has been using Historic Environment Record (HER), the Great Linford Manor Grounds, Milton Keynes, Draft Conservation Management Plan (Hiorns, A. 2013) and monuments data provided by Nick Crank from Milton Keynes Council (Milton Keynes Council, 2017).
- 3.2 All referenced numbers in the brief background below relate to monument numbers from the Milton Keynes HER. The archaeological background is discussed in periodic order and describes the known remains within each period.
- 3.3 This background does not look at the archaeological potential for these periods, as this report does not include any impact assessment and is solely concerned with the known archaeology alongside the results of the geophysical survey.

Prehistoric

- 3.4 There are no recorded remains of prehistoric date within the proposed park development area itself. Prehistoric remains are likely in the wider area and many remains have been unearthed throughout the county.
- 3.5 For example, a Ring ditch thought to date to the Bronze Age (MMK1199) has been located in the wider surrounding area outside of the site boundary.

Roman

- 3.6 There are no known remains from the Roman period within the proposed park development area. Within the wider area possible Roman activity has been unearthed and two such monument records are recorded in the wider search area.
- 3.7 The first of these is a find spot of a large nail, possibly Roman, found in association with a coin dated 308-313AD, found at 43 Parklands, 350 metres west of the manor (MMK1826).
- 3.8 The second is a forgery dating to the 4th century AD was found in a cobble yard associated with a later medieval house platform east of the village (MMK1886).

Medieval and Post-Medieval

- 3.9 The following information has been derived from the Great Linford Manor Grounds Conservation Management Plan. All references in this section are from the Conservation Management Plan. Its detail is such that it was deemed unnecessary to reproduce our own background based on HER data and this Draft Conservation Management Plan (Hiorns, A. 2013).
- 3.10 The earliest known remains for the area are from the 7th to 8th centuries. A place of worship at Great Linford was known to exist around 1151-54 as it is mentioned in a charter, with recorded changes and alterations to the Church between the 12th and 14th centuries. In 1706 an Agreement was drawn up between Richard Uthwatt, Daniel King (Sir William Pritchard's nephews and Lords of the Manor on his death in 1704) and the Rector, John Coles, concerning the condition of the village church. The Agreement states that "It is agreed.... that they.... Shall take down the Roof and walls of the Chancel and Rebuild the same...before the feast day of St Michael the Archangell in the year of our Lord God One thousand seven hundred and seven' (Williams, 1983). It is presumed they were responsible for the rebuilding of the chancel and the interior alterations between 1706 and 1710; the medieval decoration was plastered over and the coved ceiling inserted. In 1980 restoration work on the church uncovered the original lath-and-plaster coved ceiling and the king-post roof structure.
- 3.11 A substantial medieval hall house was built at Great Linford in the 15th Century. In 1633 Sir Richard Napier acquired the Manor House. In 1641 'The Plot of the Mannor of Great Linford' shows the important buildings of the village and the land ownerships. The survey of the village in 1678 by surveyor Richard Browne shows 'The Mannor of Greate Lynford', and the major buildings of the village, together with their landholdings.
- 3.12 In 1679 Sir Richard Napier sold the Manor to Sir William Pritchard (1630-1704). Between 1688-90 the original Manor House was demolished and the new house was completed by 1690 but on the opposite side of the main street to the original. The footprint of the original house was uncovered during an excavation of the South Pavilion between 1979 and 1980.
- 3.13 Between 1696-97 the Almshouses are constructed by Pritchard with a three-storey Dutch-gabled centre-piece for housing the Warden of the Almshouses. Sir William Pritchard died in 1704 and Great Linford passed to Lady Sarah Pritchard.
- 3.14 The estate formally passes to William Pritchard's nephews in 1718 after the death of Lady Sarah Pritchard. Between 1720-40 the Manor House was altered by Thomas Uthwatt in at least two separate phases. Firstly, around 1725 The North and South Pavilions are built to frame axially the Manor House and add consequence to views from the House. Then around 1740-50 Henry Uthwatt adds the Great Room to the House. In 1758 an Inventory of the House notes that it contains 21 rooms, including a large service area on the north side.

- 3.15 In 1761 Richard Woods prepared a plan for an extensive re-landscaping of the grounds at Little Linford for Matthew Knapp, who had married Catherine Uthwatt, daughter of Thomas, in 1750. There are similarities between the Little Linford landscape proposal and what was achieved at Great Linford at about the same period. Around 1780 the house was re-fronted, which probably included the creation of the walled garden.
- 3.16 In 1800 The Grand Junction Canal was constructed to the north of the estate, severing the landscape and isolating the Cascade from its ponds. In 1865 The Newport Pagnell Railway Company line was completed, again to the north of the estate and parallel to the Canal, truncating the estate. In 1875 the railway line was taken over by the London & North Western Railway until 1964; it is now a pedestrian/cycle way. A Boathouse is noted on the First Edition OS map to the north east of The Wilderness. The Doric Seat, located within the Wilderness, is shown on the same map, although the Boathouse has disappeared by the Second Edition OS Map of 1900.
- 3.17 There is little noticeable change by the Third Edition Ordnance Survey map in 1925, except the Memorial Hall has been built on the other side the village street to commemorate the Great War. A new Memorial Hall has been built with the old site developed into new homes by the time of the Seventh Edition OS map in 1982. The new Memorial Hall has an access road constructed to link it with Marsh Road, which extends to the Manor and includes a turning circle, several additional pathways and access routes to the north of the Manor House.
- 3.18 In 1964 Great Linford Manor House was briefly used as a base for Chilstone, a garden ornament company. The Milton Keynes Development Corporation (MKDC) purchased the Manor from Stella Uthwatt in 1972. Various 'village plans' are produced for the development of land around the grounds for new housing as part of the New Town prepared by a team led by Peter Winchester, with designs for Great Linford grid square by John Seed.
- 3.19 Between 1974 and 1979 MKDC extensively restored the Pavilions, Barn and Almshouses. The Almshouses are converted to craft workshops. The Barn was largely destroyed by fire in 1975 and was substantially rebuilt. In 1979 the Radcliffe Studio was built, on the site of a former Otter Hounds Kennels and possible the Coach House behind the pavilions, as part of the redevelopment by MKDC. Between 3 July and 31 October 1982 a temporary sculpture exhibition was set up at Great Linford. A 'Sculpture Walk' was laid out in the grounds and in the house. It incorporated many pieces from internationally renowned sculptors. However, by 1984 The Arts Centre was failing and the Manor House ceases to be used as an Arts Centre after its Trustees are sacked. Around this time MKDC attempted to dispose of the whole estate, including the house.
- 3.20 The tender for the house was won by Harry Maloney with plans for a recording studio in the house and a theatre in the kitchen garden. In 1986 the Manor was converted into a recording studio. By 1992 the estate was split between the Milton Keynes Parks Trust, Buckinghamshire County Council and the current owners who took over Linford Manor in 1993.

4 Aims

- 4.1 The aim of the geophysical survey was to identify any potential archaeological anomalies that would enhance the current understanding of the archaeological resource within the proposed survey area. The Gradiometer survey was undertaken to complement to Earth Resistance data with regards to helping to determine the location of ferrous services and pipes, which would be less obvious in the Earth Resistance data.

4.2 Specifically the aims of the survey were;

- To locate, record and characterise any surviving sub-surface archaeological remains within the survey area
- To help identify areas of potential further work
- To provide an assessment of the potential significance of any identified archaeological remains in a local, regional and (if relevant) national context
- To produce a comprehensive site archive and report.

5 Methodology

- 5.1 All geophysical survey work was carried out in accordance with recommended good practice specified in guideline documents published by English Heritage – now Historic England (David *et al.* 2008) and the Chartered Institute for Archaeologists *Standard and Guidance for archaeological geophysical survey* (2014).
- 5.2 Parameters were selected that were suitable for the prospective aims of the survey and in accordance with recommended professional good practice (David *et al.* 2008, 8).
- 5.3 The gradiometer survey was carried out using Bartington Grad601-2 fluxgate gradiometers (see Appendices 2 and 3). Data was collected on an east-west alignment using zig-zag traverses, with a sample interval of 0.25m and a traverse interval of 1m. A total of 52 full or partial 30m by 30m grids were surveyed within the specified area, totalling an area of approximately 3.38ha.
- 5.4 The Earth Resistance survey was carried out using a Geoscan Research RM15 resistance meter, utilising a MPX15 multiplexor attachment (see Appendices 2 and 3). Data was collected on an east-west alignment using zig-zag traverses, with a sample interval of 0.5m and a traverse interval of 0.5m. A total of 101 full or partial 30m by 15m grids were surveyed, totalling an area of approximately 3.38ha.
- 5.5 Attention was taken to avoid metal obstacles present within the survey area during data collection using gradiometers. Gradiometer survey is affected by 'above-ground noise' such as metal objects, and avoiding these improves the overall data quality and results obtained.
- 5.6 The gradiometer data were downloaded using Bartington Grad601 PC Software v313 and processed using Geoscan Geoplot v3.0 / v4.0. The details of these processes can be found in Appendices 4 and 5. Data processing, storage and documentation were carried out in accordance with the good practice specifications detailed in the guidelines issued by the Archaeology Data Service (Schmidt and Ernenwein, 2009).
- 5.7 The Earth Resistance data were downloaded and processed using Geoscan Geoplot v3.0 / v4.0, and the details of these processes can be found in Appendices 4 and 5.
- 5.8 Interpretations of the data were created as layers in AutoCAD LT 2009 / GIS and the technical terminology used to describe the identified features can be found in Appendix 6.

6 Results and Interpretation

- 6.1 The gradiometer survey results have been visualised as greyscale plots, with the minimally processed data plotted at -1nT to 2nT in Figure 3. The interpretation of the gradiometer data follows this in Figure 4, and an individual characterisation of the identified anomalies follows in Appendix 1.

- 6.2 The earth resistance survey results have also been visualised as greyscale plots, with the minimally processed data plotted between -5 to 40 ohms in Figure 5. The processed data has been plotted at -5 to 5 ohms in Figure 6 and at -10 to 10 ohms in Figure 7. An interpretation of the overall earth resistance data can be seen in Figure 8, and for clarity, a schematic interpretation has been created in Figure 9. An individual characterisation of the identified anomalies follows this in Appendix 1.

Gradiometer Results (Figures 2 – 4)

Archaeology

- 6.3 The gradiometer survey successfully identified the location of the historic Great Linford Manor Doric Seat (MMK5782) in the north-east of the site (**G1**). The positive anomaly, coupled with a negative response, is amorphous in shape however it complements the Earth Resistance data in confirming the location of the seat.

Linear trends / Area of Disturbance – Unclear Origins

- 6.4 Several discrete linear trends of an unclear origin have been identified in the north-east of the dataset. The largest of these is a long linear zone of magnetic disturbance which runs across the area in a north-west to south-east direction (**G2**). This strong positive anomaly, surrounded by a negative response, is unusual in its form, and could represent a possible service, culvert or sewer, or the path of an old river channel. A manhole cover / access chamber was observed in the same location as this anomaly, suggesting the feature is accessible and large.
- 6.5 Linear and curvilinear trends of an unknown origin are observed in the north-east of the dataset, running in a north-north-west to south-south-east direction and curving slightly (**G3**). These are located to the south-east of the Doric Seat and may be former landscaping and terracing features. A sub-circular trend is observed in amongst the linear trends which may have an archaeological origin.

Non-archaeology

Magnetic disturbance / possible services

- 6.6 A large amount of magnetic disturbance is observed across the entire dataset. These areas of disturbance are likely to be caused by modern activity and are characterised by significant increases or decreases in magnetic values compared with background readings. Many of these areas of disturbance relate to the modern park features, such as paths, walls and landscaped ground.
- 6.7 In the north and north-west of the dataset, the disturbance could relate to flood debris from the adjacent canal, or alternatively landscaping involving the construction of the canal (**G4**). This is also seen in the Earth Resistance data as a very quiet / blurry low resistance response.
- 6.8 Several strong linear anomalies cross the dataset, which are most likely related to services. Some of these have areas of associated magnetic disturbance running either side of them (**G5**). These anomalies are often composed of contrasting high positive and negative values. Such anomalies usually signify a feature with a high level of magnetisation and are likely to belong to modern activity such as pipe lines or modern services.
- 6.9 Manhole covers, drains, lampposts and park signs were also observed in the survey area which have accounted for some areas of magnetic disturbance in the data. A modern path shows in the south-east of the gradiometer data as an area of mixed positive and negative responses in a linear alignment (**G6**).
- 6.10 Across the data set there are a large quantity of isolated dipolar anomalies (iron spikes). These are commonly caused by ferrous or high magnetically susceptible material on the surface or within the

topsoil of the site, and it is likely that modern agricultural activity has changed the magnetic properties of the top soil and created a high level of background 'noise' within the data set.

Earth Resistance Results (Figures 2 & 5 – 9)

Archaeology

- 6.11 The Earth Resistance survey also successfully identified the location of the historic Linford Manor Doric Seat (MMK5782) in the north-east of the site (**E1**). The anomaly is shown as a rectangular zone of high resistance surrounding a small area of low resistance, with a further area of high resistance extending out to the north where the seat is said to have been orientated towards the canal, in a kind of 'promenade' feature. (See Appendix 7 for a photograph of the Linford Manor Doric Seat for reference).
- 6.12 An anomaly consisting of both a high and low areas of resistance has been located within a small circular ornamental garden area (**E2**). Only a small hollow in the ground was observed at the time of survey, however historic mapping from 1881 shows a dot marked in this area with an abbreviation S.D. This could suggest the possible location of a former sun dial (OS 1st Edition, 1881, Old-maps, 2017). Interestingly what appears to be a stone column is also visible on an historic photograph of the Chilstone ornaments (see Appendix 7). The use of this column is unknown however the footings of this column may also be the reason for this area of high resistance. Intriguingly the Chilstone ornaments were built originally within the park area and there is reference to a Chilstone ornament being made with a sundial for the grounds of the Great Linford Manor.
- 6.13 A large high resistance anomaly running north-south through the data set in the central part of the survey is likely to be the remains of a possible former road (**E3**). This anomaly would appear to line up with the existing road entering the park in the south and is thought to be formerly the route of a road which ran to the original medieval settlement of Great Linford, which is not visible on historic mapping. However, the avenue of trees which followed this road is visible on historic mapping from 1881 (Old-maps, 2017 & Appendix 7) and is seen in the data as regularly spaced patches of low resistance. Some of these trees were still visible in the south of the area and reflect the patches of low and high resistance in the data.

Linear Trend – Old Field Boundary

- 6.14 A former field boundary is observed in the south-west of the dataset, running first in a northerly direction then changing direction and running towards the north-east (**E4**). The location of the boundary has been confirmed by historic mapping from 1881 (OS 1st Edition, 1881, Old-maps, 2017).
- 6.15 A possible former field boundary is also visible in the north-east of the dataset (**E5**), where a curving linear high resistance anomaly runs roughly from the south to the north-west. Historic mapping suggests that there is a boundary in this location, however it is slightly different to the location as suggested by current mapping. The anomaly may relate to landscaping or terracing instead, as it is similar to a high and low resistance anomaly just to the west.

Unclear Origins

- 6.16 A number of areas of high and low resistance were identified throughout the dataset which are likely to relate to possible former park features and landscaping. As these cannot be confirmed by historic mapping or known historic HER data, these can only be categorised as unclear archaeological features.

- 6.17 The first of these are noted in the north east of the site adjacent to the Doric Seat. In the main part of this area a strong north-south orientated feature of both high and low resistance has been recorded (**E6**). This feature could be another garden division, or possibly a second Ha-Ha facing towards the east. The anomaly is suggestive of a wall, which is high resistance, running alongside a ditch which is low resistance. The magnetometer survey also identified a linear anomaly in the same location and orientation which was also suggestive of a ditch like feature.
- 6.18 A similar response is seen in the data to the north of the Doric Seat, orientated west to east (**E7**), which could also be a wall-like feature or garden feature. This anomaly could curve round to the south-east and join feature **E6** forming an enclosure around the Doric Seat, or a further Ha-Ha feature, however further investigation would confirm this.
- 6.19 As discussed in the magnetometry results, a large magnetic response runs through the north-east of the park and has initially been interpreted as a possible accessible culvert (**G2**). The resistance data has also identified this feature, with an inconsistent low resistance anomaly running through the data in a north-west south-east direction (**E8**). The anomaly appears as low resistance possibly due to a pooling or collection of moisture around the feature below the surface.
- 6.20 A number of other high resistance anomalies around the Doric Seat area are likely to be the result of disturbance from tree and vegetation roots (**E9**). Only more intrusive work will confirm this interpretation.
- 6.21 Moving westwards in the survey area, the earth resistance results similarly have been affected by tree roots and services. A number of interesting narrow high resistance anomalies have been detected in the data running roughly north-west to south-east (**E10–E11**). These are suggestive of former pathways through the park, especially in the case of **E11** where it runs towards the south-east, appearing to joining an existing path just outside the survey area.
- 6.22 The survey areas directly in front of the existing manor, north and south of the circular ornamental garden, have produced a number of high and low resistance responses (**E12**). Although some of these anomalies appear to suggest the presence of linear garden features, they don't form any definitive pattern. It is likely that this area in particular has seen significant landscaping and therefore determining if these are former garden features such as flower beds, pathways, walls or former building foundations would require further investigation. Historical photographs show a number of trees located in this area that would appear to coincide with areas of high resistance in the data (see Appendix 7), however it is difficult to make out any further garden features that the dataset suggests.
- 6.23 Moving further westwards towards the Almshouses, a number of high and low resistance anomalies have been detected (**E13**). These could represent former building foundations, former garden features such as the Chilstone ornaments, further features (e.g. sub circular anomaly **E14**) or a combination of more recent landscaping and trees and modern services through the area. Historical photographs of the area suggest that some of these anomalies may relate to trees.
- 6.24 It is possible to suggest that the linear areas of high resistance, running west-east towards the manor house may have been former flower beds or paths, forming a kind of avenue towards the manor (**E15**).
- 6.25 Towards the north-west of the area, the resistance would appear to become quieter and more uniform, probably as a result of fewer services and modern park features. The high and low resistance features detected in this area are likely to be more a result of natural origins (**E16**) and may correlate with an area of vegetation seen in historic photographs (see Appendix 7). These are

likely caused by areas of former trees, tree roots or existing trees and shrubbery which are causing high and low resistance readings, due to the lack of defined shape or form of these features.

Areas of Disturbance (Modern Services?)

- 6.26 A number of areas of possible modern disturbance have been detected in the data, one of which is likely to represent a possible service. The first of these is a linear feature running north-south (**E17**), which is visible as a low resistance anomaly in the resistance data but is not visible in the magnetometer data. It runs from the corner of the Almshouse building and it is feasible that it is a modern service for this building.
- 6.27 Another possible area of modern disturbance is located in the north west of the survey area, where it is thought the survey has detected the extents to which the canal was landscaped and built-up (**E18**). In this area both high magnetism associated with modern disturbance as well as low and high resistance anomalies in a similar area would appear to correlate with a change of topography visible in the area running up to the canal. Again this is only classed as 'possible modern disturbance' as there is no supportive historic information.

Areas of Disturbance (Modern Services)

- 6.28 Throughout the main survey area a number of linear responses have been identified in both the magnetometry and earth resistance datasets and have been classed as possible pipes, cables or modern services (**G5** anomalies, seen as **E19** & **E20**).
- 6.29 Anomaly **E21** is the result of modern landscaping and a gravel path running to the north-east, which was visible on the surface at the time of survey and is also visible on the historic photographs (see Appendix 7).
- 6.30 It is likely that these results have detected only the larger services and further intrusive work may locate other services that, when cross referenced with the datasets, identify those more tentative anomalies as further services / pipes / cables.
- 6.31 It must be suggested that any future work should cross reference a service plan of the park with the geophysical survey results, as further services may be located and ruled out as being potential garden features.

7 Conclusion

- 7.1 Both the Gradiometer survey and Earth Resistance survey successfully identified the location of the historic Linford Doric Seat in the north-east of the area, as well as possible associated landscaping and terracing further east of this monument.
- 7.2 The footings of an ornamental sundial have also likely been discovered in the front of the main house in the small circular ornamental garden area.
- 7.3 A number of other possible garden features have also been suggested and going forward, a targeted investigation of certain features may well be the next stage in confirming these results.
- 7.4 A number of features of an unclear origin have also been detected, in particular in the area in front of the current manor building. It is possible that these could mark the footings of early buildings, however the more recent landscaping, trees and modern services are more likely to be the reason for the anomalies in the data from this area. Some of these anomalies have been compared with historical photographs and mapping to help aid their interpretation. However only more intrusive investigation will aid the interpretation of the data from this area.

- 7.5 Throughout all parts of the survey area, the effect of trees and shrubberies, as well as criss-crossing services are likely to be the main reason for many of the anomalies highlighted in the interpretations.
- 7.6 It should be stressed that going forward, investigations should start by trying to locate and plan the route of modern services running across the site. This will likely support or dismiss anomalies and features interpreted in this report. It will also help establish the results which have the most potential, which can then be targeted with more intrusive investigative methods.

8 Statement of Indemnity

- 8.1 Although the results and interpretation detailed in this report have been produced as accurately as possible, it should be noted that the conclusions offered are a subjective assessment of collected data sets.
- 8.2 The success of a geophysical survey in identifying archaeological remains can be heavily influenced by several factors, including geology, seasonality, field conditions and the properties of the features being detected. Therefore the geophysical interpretation may only reveal certain archaeological features and not produce a complete plan of all of the archaeological remains within a survey area.

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Plate 1. Survey area looking east towards the manor



Plate 2. Survey area looking north towards the canal



Plate 3. Survey area looking south east towards the manor



Plate 4. Survey area looking north east at the pavilion

GREAT LINFORD MANOR PARK, MILTON KEYNES
(AOC PROJECT NO. 51744)

Figure

1

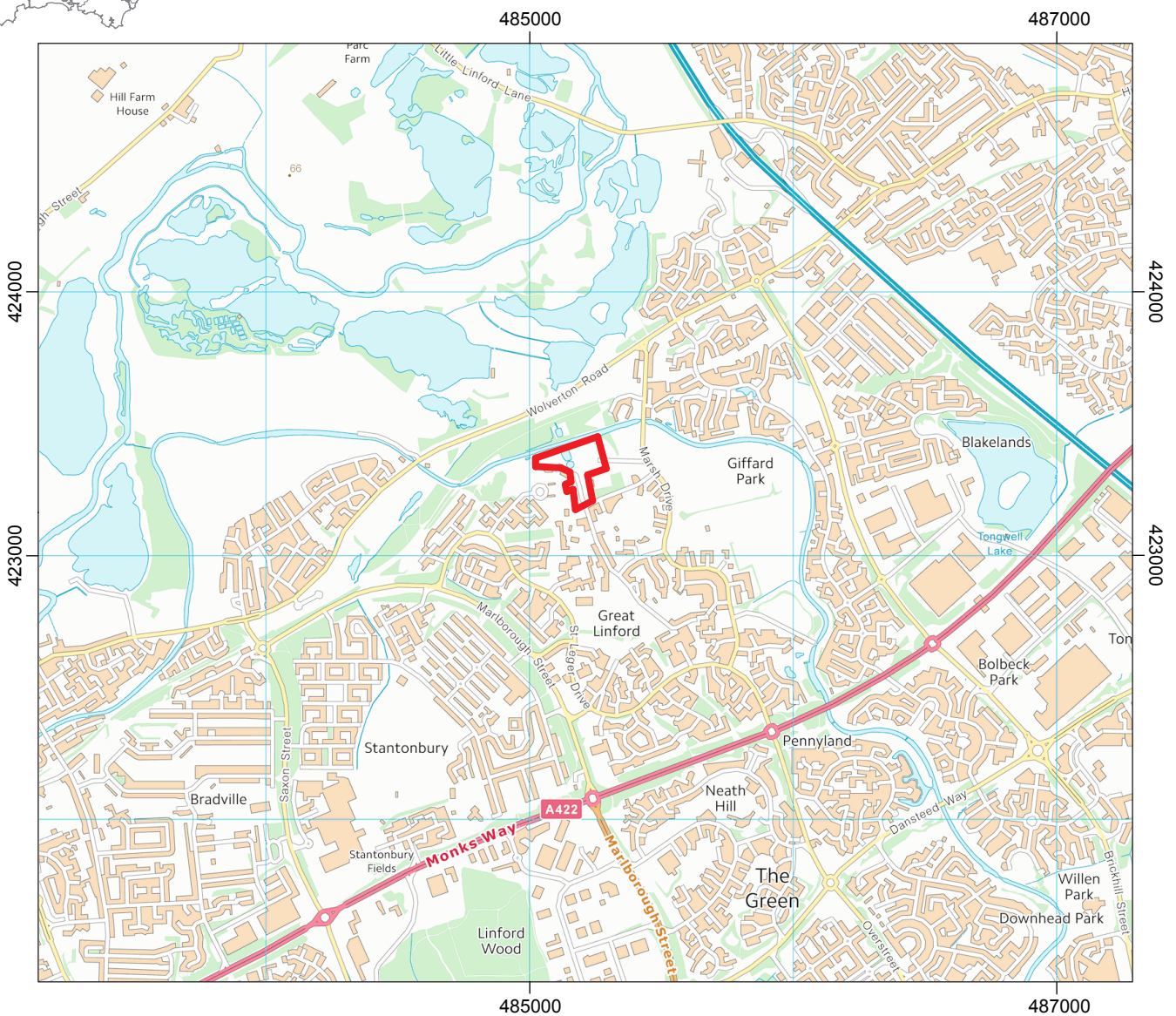


Site location



Based on data provided by the Ordnance Survey with
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Stationary Office.

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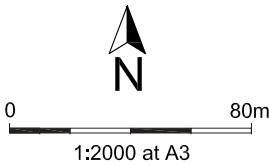


Location of survey areas - Earth Resistance survey

Location of survey areas - Gradiometer survey

Figure
2

- Areas Surveyed - Earth Resistance
- Areas Surveyed - Gradiometer
- Areas Not Surveyed



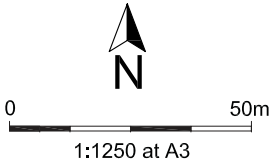
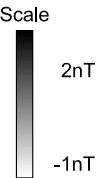
Project Title: Great Linford Manor Park, Milton Keynes		
Project No: 51744		
Drawing Title: Figure 2		
Location of Survey Areas		
V1/51744/GEO/F2/20.06.17		
Drawn by: KT	Checked by: JL	Approved by: JL
20/06/2017	20/06/2017	20/06/2017





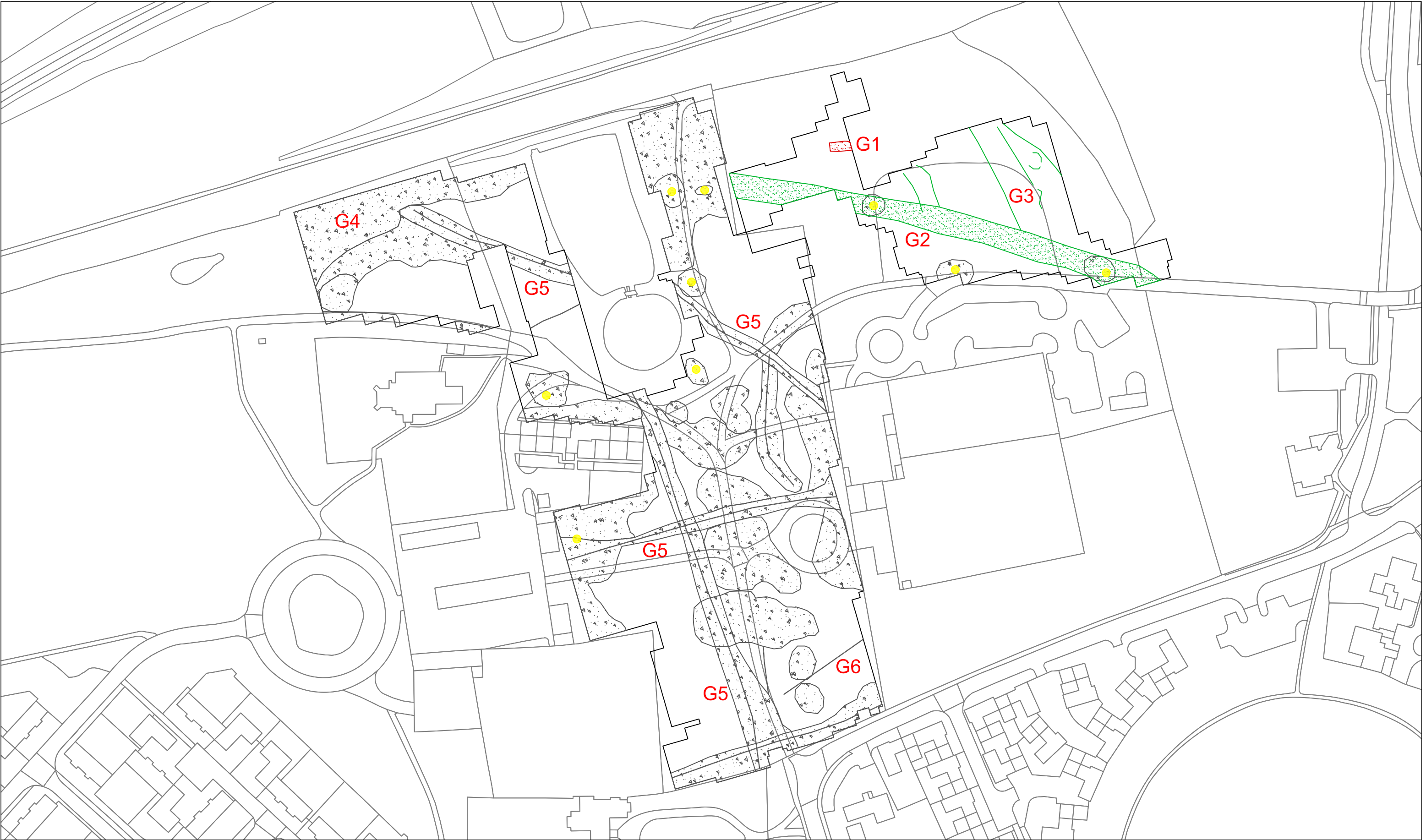
Processed Gradiometer survey results - Greyscale plot

Figure
3



Project Title: Great Linford Manor Park, Milton Keynes		
Project No: 51744		
Drawing Title: Figure 3		
Processed Gradiometer survey results		
V1/51744/GEO/F3/20.06.17		
Drawn by: KT	Checked by: JL	Approved by: JL
20/06/2017	20/06/2017	20/06/2017





Interpretation of Gradiometer survey results

Figure
4

- | | |
|--------------------------------------|--|
| Trend (Archaeology) | Linear Trend (Modern Service) |
| Area of Disturbance (Archaeology) | Area of Disturbance (Modern) |
| Trend (Unclear Origin) | Modern object (manhole cover / lamp post / sign) |
| Area of Disturbance (Unclear Origin) | |



Project Title: Great Linford Manor Park, Milton Keynes		
Project No: 51744		
Drawing Title: Figure 4		
Interpretation of Gradiometer survey results		
V1/51744/GEO/F4/20.06.17		
Drawn by: KT	Checked by: JL	Approved by: JL
20/06/2017	20/06/2017	20/06/2017





Minimally processed Earth Resistance survey results - greyscale plot

Figure
5

Scale

40 ohms
-5 ohms

0 50m
1:1250 at A3

Project Title: Great Linford Manor Park, Milton Keynes		
Project No: 51744		
Drawing Title: Figure 5		
Minimally processed Earth Resistance survey results		
V1/51744/GEO/F5/20.06.17		
Drawn by: KT	Checked by: JL	Approved by: JL
20/06/2017	20/06/2017	20/06/2017



Processed Earth Resistance survey results - greyscale plot : -5 to 5 ohms

Figure
6

Scale

5 ohms

-5 ohms

0

50m

1:1250 at A3

Project Title: Great Linford Manor Park, Milton Keynes
Project No: 51744

Drawing Title: Figure 6
Processed Earth Resistance survey results: -5 to 5

V1/51744/GEO/F6/20.06.17

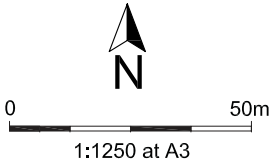
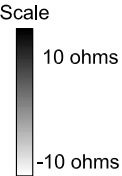
Drawn by: KT	Checked by: JL	Approved by: JL
20/06/2017	20/06/2017	20/06/2017

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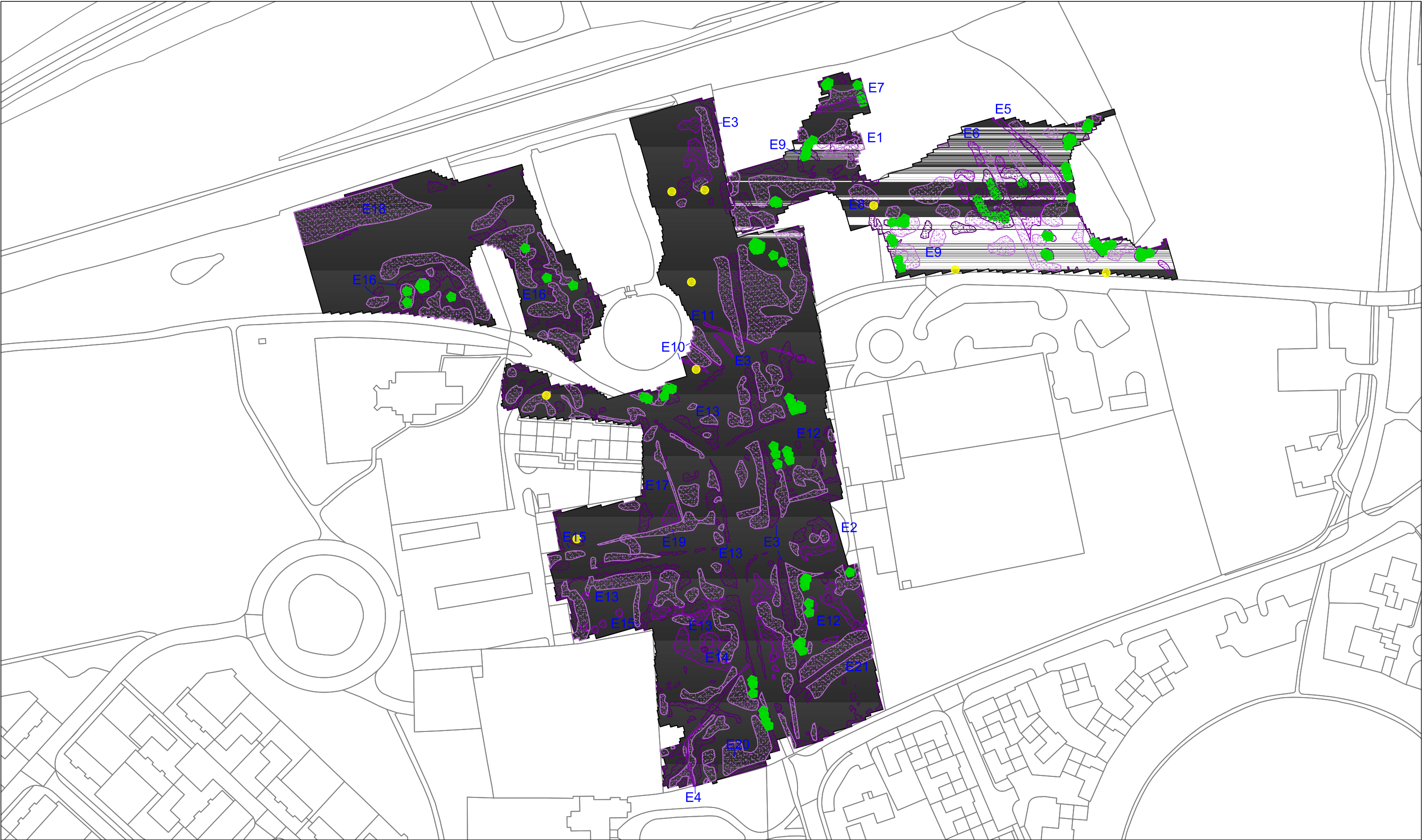
Processed Earth Resistance survey results - greyscale plot : -10 to 10 ohms

Figure
7



Project Title: Great Linford Manor Park, Milton Keynes		
Project No: 51744		
Drawing Title: Figure 7		
Processed Earth Resistance survey results: -10 to 10		
V1/51744/GEO/F7/20.06.17		
Drawn by: KT	Checked by: JL	Approved by: JL
20/06/2017	20/06/2017	20/06/2017





Interpretation of Earth Resistance survey results

Figure
8

Area of Very High Resistance

Area of High Resistance

Area of Low Resistance

Vegetation

Modern object (manhole cover / lamp post / sign)

0

50m

N

1:1250 at A3

Project Title: Great Linford Manor Park, Milton Keynes

Project No: 51744

Drawing Title: Figure 8

Interpretation of Earth Resistance survey results

V1/51744/GEO/F8/20.06.17

Drawn by: KT

20/06/2017

Checked by: JL

20/06/2017

Approved by: JL

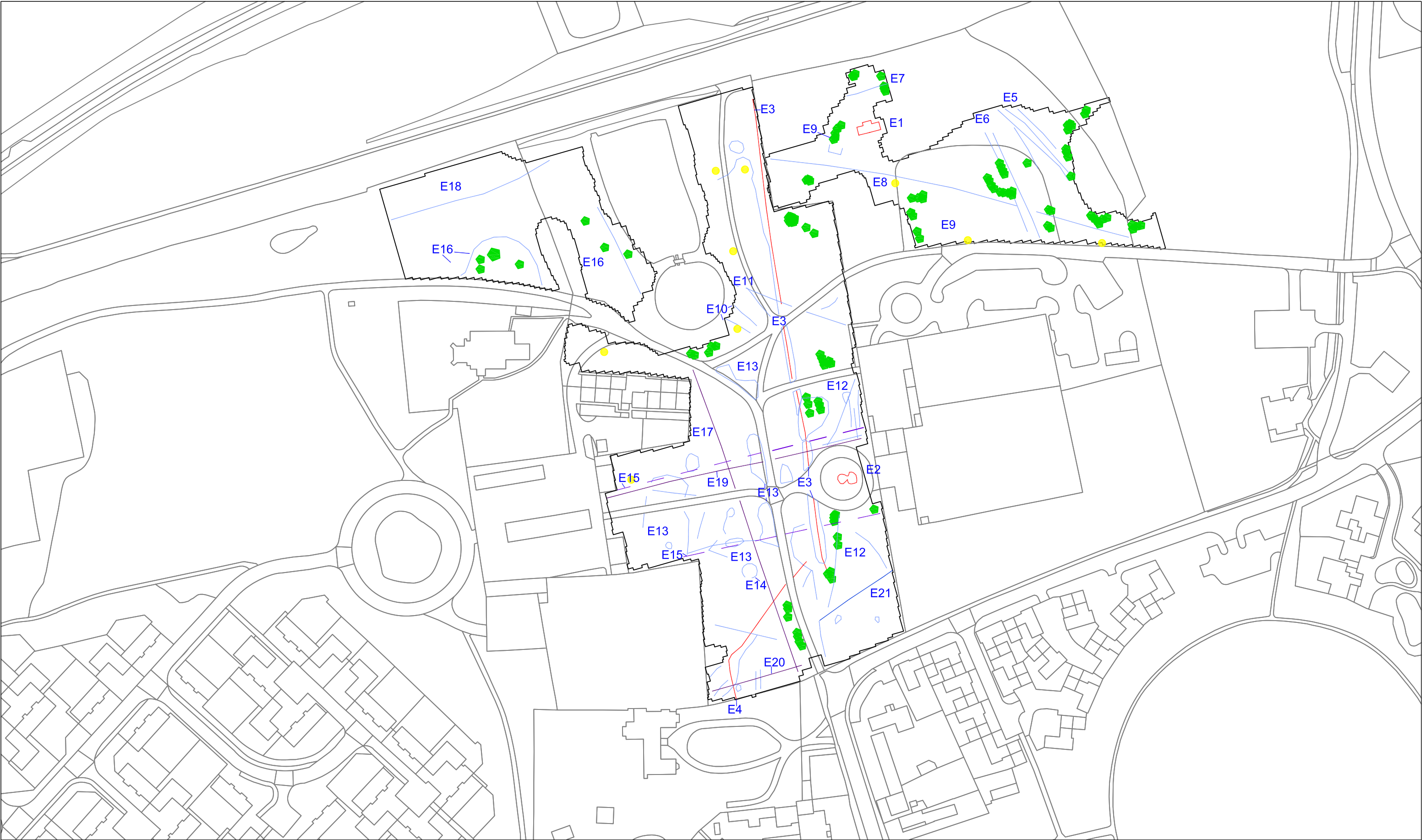
20/06/2017

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Archaeology

Group

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Schematic Interpretation of Earth Resistance survey results

Figure 9

- | | | |
|----------------------|----------------------------|--|
| Known Archaeology | Suggested Avenue Alignment | Modern object (manhole cover / lamp post / sign) |
| Known Modern Feature | Possible Service | |
| Unknown Feature | Vegetation | |



Project Title: Great Linford Manor Park, Milton Keynes		
Project No: 51744		
Drawing Title: Figure 9		
Schematic Interpretation of Earth Resistance results		
V1/51744/GEO/F9/20.06.17		
Drawn by: KT	Checked by: JL	Approved by: JL
20/06/2017	20/06/2017	20/06/2017



Appendix 1: Individual Characterisation of Identified Anomalies

Gradiometer survey

Site Specific Anomaly Code: **G**

Anomaly	Type of Archaeology
G1	Archaeology – Linford Manor Doric Seat
G2	Magnetic Disturbance – Unclear origin
G3	Linear trends – Unclear origin
G4	Magnetic Disturbance
G5	Magnetic Disturbance – possible service
G6	Magnetic Disturbance - path

Earth Resistance survey

Site Specific Anomaly Code: **E**

Anomaly	Type of Archaeology
E1	Archaeology – Linford Manor Doric Seat
E2	Archaeology – Sun Dial
E3	Archaeology – Possible former road
E4	Archaeology – Old Field Boundary
E5	Archaeology? – Possible Old Field Boundary
E6	Unclear origin – high & low resistance
E7	Unclear origin – high & low resistance
E8	Unclear origin – low resistance
E9	Unclear origins – possible tree roots
E10	Unclear origins – possible former pathways
E11	Unclear origins – possible former pathways
E12	Unclear origins – possible garden features
E13	Unclear origins – possible garden features
E14	Unclear origins – possible sun-circular garden features
E15	Unclear origins – possible garden features / avenue
E16	Unclear origins – possible vegetation / garden features
E17	Area of Disturbance – possible service
E18	Area of disturbance – canal landscaping
E19	Area of disturbance – possible modern service
E20	Area of disturbance – possible modern service
E21	Area of disturbance – pathway

Appendix 2: Survey Metadata

Field	Description
Surveying Company	AOC Archaeology
Data collection staff	Alistair Galt, Daniel Shiel, Danny Allsebrook
Client	Cotswold Archaeology
Site name	Great Linford Manor Park
County	Buckinghamshire
NGR	SP 85195 42384
Land use/ field condition	Parkland, woodland
Duration	22/5/17 - 7/6/17
Weather	Sunny, rain
Survey type	Gradiometer Survey
Instrumentation	Trimble GXOR system Bartington Grad 601-2 Earth Resistance – RM15 and MPX15
Area covered	Approx 3.38 ha (101 full and partial resistance grids, 52 gradiometer full and partial grids)
Download software	Grad601 PC Software v313
Processing software	Geoplot v3.0 and v4.0
Visualisation software	AutoCAD LT 2009
Geology	The bedrock geology Blisworth formation (BGS 2017)
Soils	Lime-rich loamy and clayey soils with impeded drainage (Soilscapes 2017)
Scheduled Ancient Monument	No
Known archaeology on site	None
Historical documentation/ mapping on site	None
Report title	Great Linford Manor Park, Milton Keynes
Project number	51744
Report Author	Kimberley Teale & James Lawton
Report approved by	James Lawton

Appendix 3: Archaeological Prospection Techniques, Instrumentation and Software Utilised

Gradiometer survey

Gradiometer surveys measure small changes in the earth's magnetic field. Archaeological materials and activity can be detected by identifying changes to the magnetic values caused by the presence of weakly magnetised iron oxides in the soil (Aspinall *et al.*, 2008, 23; Sharma, 1997, 105). Human inhabitation often causes alterations to the magnetic properties of the ground (Aspinall *et al.*, 2008, 21). There are two physical transformations that produce a significant contrast between the magnetic properties of archaeological features and the surrounding soil: the enhancement of magnetic susceptibility and thermoremanent magnetization (Aspinall *et al.*, 2008, 21; Heron and Gaffney 1987, 72).

Ditches and pits can be easily detected through gradiometer survey as the top soil is generally suggested to have a greater magnetisation than the subsoil caused by human habitation. Also areas of burning or materials which have been subjected to heat commonly have high magnetic signatures, examples include: hearths, kilns, fired clay and mudbricks (Clark 1996, 65; Lowe and Fogel 2010, 24). It should be noted that negative anomalies can also be useful for characterising archaeological features. If the buried remains are composed of a material with a lower magnetisation compared with the surrounding soil, the surrounding soil will consequently have a greater magnetisation resulting in the feature displaying a negative signature. For example stone materials of a structural nature that are composed of sedimentary rocks are considered non-magnetic and so will appear as negative features within the data set.

Ferrous objects- i.e. iron and its alloys- are strongly magnetic and are typically detected as high-value peaks in gradiometer survey data, though it is not usually possible to determine whether these relate to archaeological or modern objects.

Although gradiometer surveys have been successfully carried out in all areas of the United Kingdom, the effectiveness of the technique is lessened in areas with complex geology, particularly where igneous and metamorphic bedrock is present. All magnetic geophysical surveys must therefore take the effects of background geological and geomorphological conditions into account.

Gradiometer survey instrumentation

AOC Archaeology's gradiometer surveys are carried out using Bartington Grad601-2 magnetic gradiometers. The Grad601-2 is a high-stability fluxgate magnetic gradient sensor, which uses a 1m sensor separation. The detection resolution is from 0.03 nT/m to 0.1nT/m, depending on the sensor parameters selected, making the Grad601-2 an ideal instrument for prospective survey of large areas as well as detailed surveys of known archaeology. The instrument stores the data collected on an on-board data-logger, which is then downloaded as a series of survey grids for processing.

Gradiometer survey software

Following the survey, gradiometer data is downloaded from the instrument using Grad601 PC Software v313. Survey grids are then assembled into composites and enhanced using a range of processing techniques using Geoscan Geoplot v3.0 / v4.0 (see Appendix 4 for a summary of the processes used in Geoplot and Appendix 5 for a list of processes used to create final data plots).

Earth Resistance survey instrumentation

AOC Archaeology's Earth Resistance Surveys are conducted using a Geoscan Research RM15 resistance meter, with a set number of probes and remote probes depending on the chosen survey methodology, utilising a MPX15 multiplexor attachment if required (see Appendices 2 and 3).

Data was collected on an east-west alignment using zig-zag traverses, with a sample interval of 0.5m and a traverse interval of 2m. The gain was set appropriate to ground conditions and the local geology.

Earth Resistance survey software

Following completion of the survey, the earth resistance data is downloaded from the instrument using Geoplot v3.0 / v4.0. The survey grids are then assembled into composites and enhanced using a range of processing techniques using Geoscan Geoplot v3.0 / v4.0 (see Appendix 4 for a summary of the processes used in Geoplot and Appendix 5 for a list of processes used to create final data plots).

Appendix 4: Summary of Processes used in Geoplot

Process	Effect
Clip	Limits data values to within a specified range
De-spike	Removes exceptionally high readings in the data that can obscure the visibility of archaeological features. In resistivity survey, these can be caused by poor contact of the mobile probes with the ground. In gradiometer survey, these can be caused by highly magnetic items such as buried ferrous objects.
De-stagger	Corrects a misalignment of data when the survey is conducted in a zig-zag traverse pattern.
Edge Match	Counteracts edge effects in grid composites by subtracting the difference between mean values in the two lines either side of the grid edge.
High pass filter	Removes low-frequency, large scale detail in order to remove background trends in the data, such as variations in geology.
Interpolate	Increases the resolution of a survey by interpolating new values between surveyed data points, creating a smoother overall effect.
Low Pass filter	Uses a Gaussian filter to remove high-frequency, small scale detail, typically for smoothing the data.
Periodic Filter	Used to either remove or reduce the appearance of constant and reoccurring features that distort other anomalies, such as plough lines.
Wallis filter	Applies a locally adaptive contrast enhancement filter.
Zero Mean Grid	Resets the mean value of each grid to zero, in order to counteract grid edge discontinuities in composite assemblies.
Zero Mean Traverse	Resets the mean value of each traverse to zero, in order to address the effect of striping in the data and counteract edge effects.

Appendix 5: Survey Processing Steps

Gradiometer survey	
Process	Extent
Zero Mean Traverse	All LMS =on, threshold -5 to 5
Despike	X=1 Y=1 Thr = 3 Repl = Mean
Clip	Min =-5 Max = 5
Destagger	All grids dir Shift = 2 Line Pattern 34-78 Dual-DS
Low Pass filter	X=1 Y=1 Wt=G
Interpolate	Y, Expand – Expand –SinX/X x2
Raw Palette Scale	Grey08 Min= -1nT Max= 2nT
Palette Scale	Grey08 Min= -1nT Max= 2nT
Resistance survey	
Process	Extent
Despike	X=1 Y=1 Thr = 3 Repl = Mean
Clip	Min = -5 Max = 5
High Pass filter	HPF x=10 y=10 wt =u
Interpolate	X, Expand – sin x/x Y, Expand – sin x/x
Palette Scale	Grey55 Min= -100.09 ohm Max= 94.64 ohm

Appendix 6: Technical Terminology

Type of Anomaly	Description
Archaeology	
Archaeology - Trend	These are made up of linear / curvilinear / rectilinear anomalies and are either characterised by an increase or decrease in values compared to the magnetic background. This evidence is normally supported by the presence of archaeological remains and is confirmed by other forms of evidence such as HER records and aerial photography.
Archaeology - Area of Disturbance	This is characterised by a general increase and decrease of magnetic responses over a localised area and does not appear as having a linear form. These anomalies do not have the high dipolar response which are manifested in an 'iron spike' anomaly. This anomaly may be supported by the known location of a former building, or other forms of evidence such as HER records and aerial photography.
Archaeology - Pit	An anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is suggestive of buried remains, such as the infill of a pit. This evidence is normally supported by the presence of archaeological remains and is confirmed by other forms of evidence such as HER records and aerial photography.
Discrete Archaeology	
Archaeology? – Trend	Anomalies of a linear / curvilinear / rectilinear form either composed of an increased or decreased signal compared to magnetic background values. It is possible these anomalies belong to archaeological remains, but poor patterning or weaker response values makes interpretation difficult. Where historical records are present, the anomalies would appear to be weak or inconclusive.
Archaeology? - Area of Disturbance	Anomalies with an increase or decrease in magnetic values compared with the magnetic background over a localised area. Poor patterning or weak signal changes creates difficulty in defining the origin of the anomaly and so interpretation is only tentative. The anomaly lacks definitive records to confirm its origin as being archaeological. Disturbed areas could indicate the presence of buried rubble relating to fallen structures, or instead denote modern material from either quarrying or agricultural activity. On certain geologies these anomalies could be caused by in-filled natural features.
Archaeology? – Pit	An anomaly composed of an increase in magnetic values with a patterning on the XY trace plot that is suggestive of buried remains, such as the infill of a pit, but is isolated in its location and association with other features.
Unclear Origin	
Linear Trend	Anomalies of a linear / curvilinear form which are composed of a weak or different change in magnetic values. Coupled with poor patterning, the anomaly is difficult to interpret and it is unclear whether it has an archaeological origin.
Area of Disturbance	An area of magnetic disturbance which consists of a variety of increased and decreased magnetic values compared with background readings, but lacks sufficient patterning or context for a conclusive interpretation. It is likely that these readings are caused by modern disturbances, but interpretation is tentative.

Agricultural

Linear Trend (Old Field Boundary)	These isolated long linear anomalies, most often represented as a negative magnetic trend, are likely to relate to former field boundaries. The magnetic signal may appear inconsistent but when the positioning is cross referenced with historic mapping, it is confirmed as a former field boundary.
Linear Trend (Old Field Boundary?)	These isolated long linear anomalies, most often represented as a negative magnetic trend, are likely to relate to former field boundaries. The positioning is not supported by historic mapping, but is often confirmed with adjacent ploughing patterns.
Linear Trend (Ridge and Furrow / Rig and Furrow)	A series of regular linear anomalies either composed of an increased or decreased magnetic response compared to background values. The width between the anomalies is consistent with that of a Ridge and Furrow ploughing regime, which is normally wider than conventional ploughing methods.
Linear Trend (Conventional ploughing)	A series of regular linear anomalies either composed of an increased or decreased magnetic response compared to background values. The regular patterning is likely to denote the presence of ploughing, however isolated trends can occasionally be observed that follow the orientation of ploughing trends seen elsewhere in the area. Anomalies seen adjacent to field edges are representative of headlands caused by ploughing.
Linear Trend (field drainage)	A series of linear anomalies of an indeterminate date, usually with a regular or herringbone patterning and regular spacing. These are likely to represent agricultural activity such as land drainage.

Non- Archaeology

Geology / Natural	An area of disturbance that is composed of irregular significant increases or decreases in magnetic values compared with background readings and is likely to indicate natural variations in soil composition or geology.
Linear Trend (possible modern service)	Anomalies of a linear form often composed of contrasting high positive and negative values. Such anomalies usually signify a feature with a high level of magnetisation and are likely to belong to modern activity such as pipe lines or modern services.
Disturbed Area (modern disturbance?)	An area of disturbance that is likely to be caused by modern activity and is characterised by significant increases or decreases in magnetic values compared with background readings.
Isolated Dipolar Anomalies / Ferrous (iron spikes)	A response normally caused by ferrous materials on the ground surface or within the top soil, which causes a 'spike' representing a rapid variation in the magnetic response. These are generally not assessed to be archaeological when surveying on rural sites, and generally represent modern material often re-deposited during manuring.

Appendix 7: Historical Photographs and Mapping



Aerial photograph from the 1970s showing the replanting of the avenue and recently constructed paths, roads and car park for the Art Centre. Some of the elms and beech trees which are now lost are also visible (Andrew Hiorns, 2013)



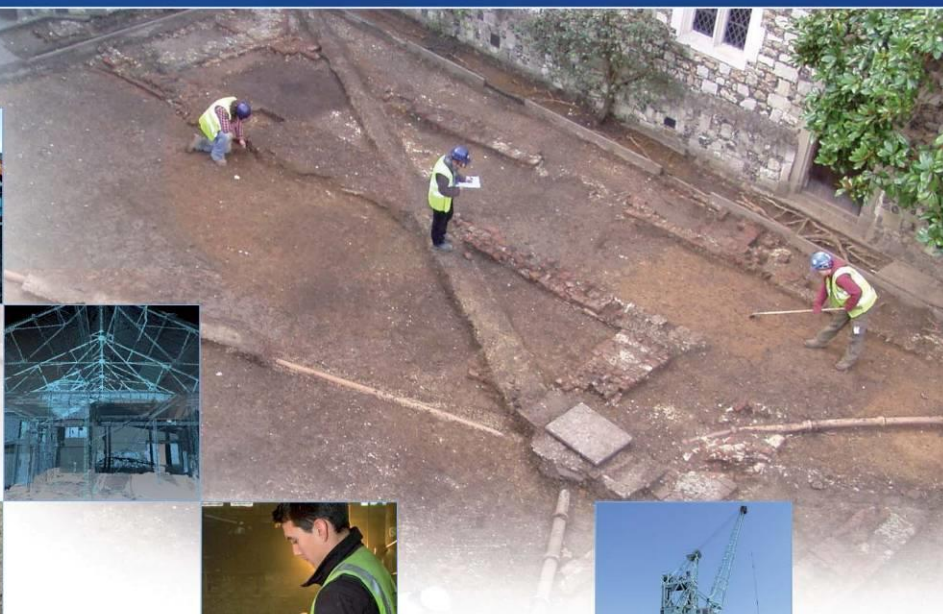
Aerial view of the Manor and Pavilions showing Chilstone ornaments (Andrew Hiorns, 2013)



The Doric Seat in the Wilderness (Andrew Hiorns, 2013)



The 1881 First Edition OS Map (Andrew Hiorns, 2013)



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