BATH & COUNTIES ARCHAEOLOGICAL SOCIETY

Royal Victoria Park, Bath west of the Royal Crescent

A report on geophysical surveys between 2016 and 2019

Janet Pryke and John Oswin

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A report on geophysical surveys to the Bath and Counties Archaeological Society 2020

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Summary

A series of geophysics surveys over the accessible areas in the section of the Royal Victoria Park between the Upper Bristol Road and Weston roads in Bath has been completed over the past four years. We know of settlements earlier in history including from Bronze Age through to Roman to the north, east and south of this work. However our results indicate no significant human habitation areas in this area, although they do indicate the remains of considerable activity. This is shown by a large number of long (mostly straight) linear features, many of which cross the area in several directions but bear little relation to the known boundaries of the eighteenth century common fields or the areas making up the current Park. Some of them relate to the routing of water through the area, and we may have detected the possible remains of an old NE/SW roadway. The remaining interpretation of the majority of these remains waits for further knowledge of the history and management of the area.

Acknowledgements

The original plan for this project was supported by Richard Sermon, at the time the Bath & North East Somerset Council (B&NES) Archaeological Officer, and permission for the survey has been obtained over the 4 years of completing from the B&NES Parks and Green Spaces department. We also thank the department for the information we have been supplied with about the Park.

We acknowledge with thanks BACAS for supplying the equipment and for the Society's encouragement and support. We thank Rick Buettner for photographic work.

We particularly thank all the society's volunteers who have helped with the work: Robert Arkell, Terri Bell and John Knapper (and for their many hours of supplementary profiling work and photography), Rick Buettner, Isobel Gleave, Heather Greenwood, Sophie Hawke, Sandra Heward, Chris Higgs, Elpitha Lemos, Tim Lunt, Sharn Pepperell (and for stone photography), Ian Perkins (and for equestrian information), Les Phillips (and for parch mark photography), John Richards (and for editorial support), Wendy Russ, John Samways, Lawrie Scott, Annie Somers-Hall, Ian Tarr, Isobel Tarr, Roger Vaughan and finally Gill Vickery, who has also given us great editorial and content support and encouragement in the complex consolidation of the four interim reports into this version.

We continue to thank Marek Lewcun who has given us helpful support and information as well as Mike Chapman for his useful discussion, for their searches and thoughts Anne Buchanan & the Public Record Office and Susan Fox, the Roman Baths Museum, also Kirsten Elliott for advice and consultation, and the inclusion of Figure 1.6 courtesy of Akeman Press archives. For their considerable help with information on park history we thank Stan Hitt, who was Director of Parks and Bill Bailey, also formerly of the Parks Department.

Acknowledgement for their publicly available information goes to the Environment Agency, the British Geological Survey and Google Earth. This is also due to Bath in Time, with thanks for permission to reproduce these images in this report.

Preface

There is evidence for past development over on this west side of Bath in pre-Roman and Roman times and the known information about these remains has been added to by our previous work.[1] This project used geophysics to examine the area to the west of these studies to add to these results. This report describes geophysical surveys of a section of the Royal Victoria Park, Bath, carried out in four 2-3 week periods between 2016-2019 by volunteer members of the Bath and Counties Archaeological Society. We have used photographs, maps and plans of the Park and area as background to this work (Bath in Time and Bath Record Office), together with information from the Historical Environment Records (HER) and have benefitted from considerable amount of discussion with local experts.

Table of Contents

Summary		i
Acknowledgements		ii
Preface		iii
Table of Contents		iv
1.	Introduction	1
1.1	Location	2
1.2	Background	3
1.3	Programme	7
1.4	Scope	7
2	Method	8
2.1	Gridding	8
2.2	Twin probe resistance measurements	8
2.3	Electrical resistivity pseudosection profiling	8
2.4	Magnetometry	8
2.5	Software	8
2.6	QGIS analysis	9
2.7	Constraints	9
3.	Results	10
3.1	LiDAR analysis	10
3.2	Resistance survey	12
3.3	Magnetometry survey	15
3.4	Resistivity profiles in the different areas of the Park	18
3.5	Other observations made during investigations in the Park	30
4	Discussion	32
4.1	The roadway and pathways across the Park	32
4.2	Large areas used for previous activities in the Park	33
4.3	The water courses in the Park	35
4.4	Other demarcations for use for different purposes	36
4.5	Possible habitation sites	39
4.6	Unknown possibilities	40
5	Conclusion	41
References		42
Appendix 1 Survey and resistivity profile arrangement		43
Appendix 2 Additional resistivity profile results		49

1. Introduction

1.1 Location

The area involved in this project is in the Royal Victoria Park, Bath, to the west of the Royal Crescent. This is shown in figure 1.1, with the area of our geophysical surveys shaded. The area is within the section of the Park bound by a circuit carriageway. The non-surveyed sections of the Park include, to the northwest, the Botanical Gardens and the Dell (the old stone quarry) and, to the south, around the Ornamental Pond.

Figure 1.1 The surveyed area of Royal Victoria Park west of the Royal Crescent shaded.
Satellite map ©Google Earth with grateful acknowledgement

Royal Victoria Park is covered by MBN11272 "Royal Victoria Park" with DBN3598 describing the nationally registered area, and it is Grade I listed (English Heritage 2013). It is sited on the northern slope of the river Avon. We also report here a small amount of resistivity profiling work in the area across the road in Ring Common Allotments to the north of the triangular piece of land including the B&NES Council Park Offices and Glasshouses, asterisked in Figure 1.

1.2 Background

The following section summarises background information about the Park and its area to relate to our interpretation of the geophysical survey.

1.2.1 Physical environment

The Park is on the north slope of the Avon river valley. The slope down towards the river averages about 1 in 20. The floor of the valley is formed of lower lias clay, obscured by river soil and alluvium. In the geological map shown below in Figure 1.2 the surveyed area is marked in red. It is in a geological layer described as Charmouth Mudstone (ChM). To the north are Fullers Earth (FE) and Inferior Oolite (InO).

In the map the hatched marking partially overlapping this area is described as “Made ground: embankment, quarry spoil and tips”. This area includes the quarry (The Dell) and the landscaping for the Botanical Gardens, around the Ornamental Pond and further to the south the young people’s play area.

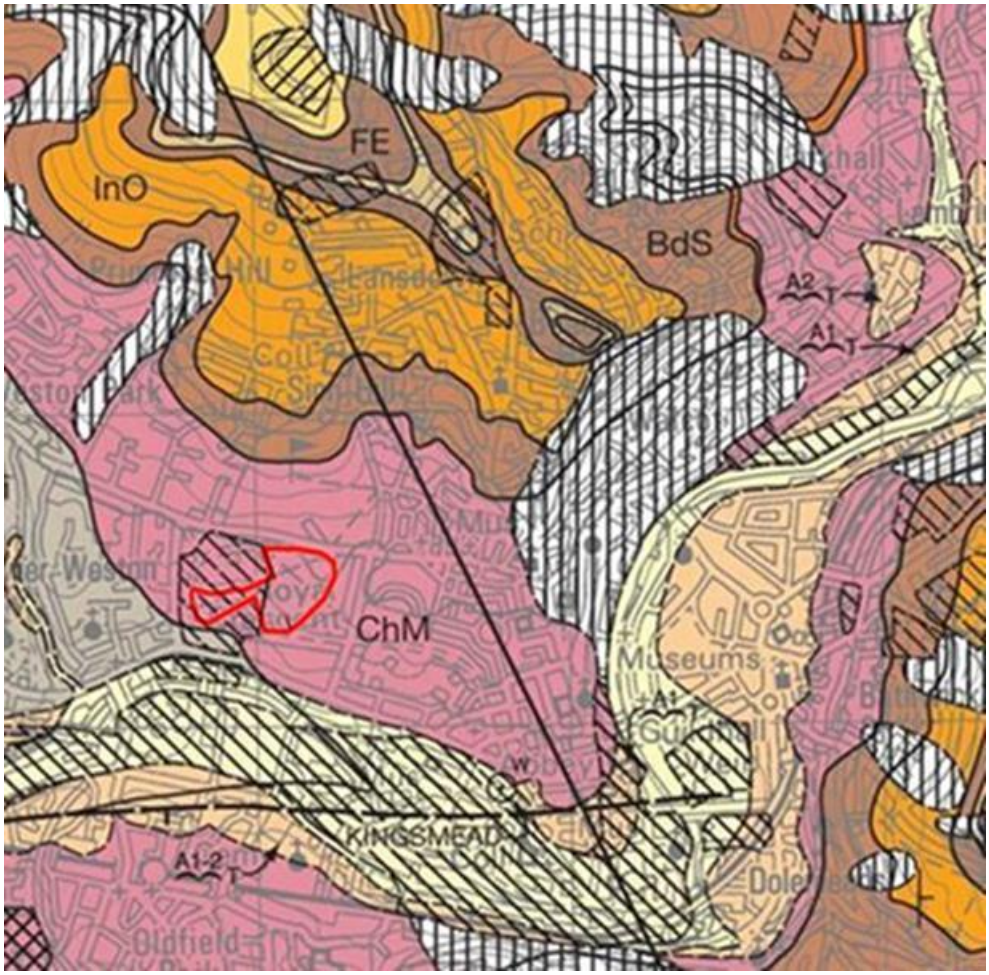

Figure 1.2 Geological map of the area with surveyed area outlined in red. England and Wales sheet 265, Bath, Bedrock and Superficial deposits, contains British Geological Survey materials © UKRI 2011

Owing to its geology with its layers of clay and limestone several natural springs exist in this Park area. A “Spring” area is present in the north of this section,[2] which is where the current water supply is centred with a reservoir tank with a manhole cover. The plan from Wessex Water kindly supplied by B&NES Parks department shows the Ornamental Pond and Botanical Gardens being fed by the pipe bringing spring water diagonally over High (Great) Common and from the St Winifred’s well area to its north east. From the Pond the water is drained down towards the river. Another map from Wessex Water shows a water course running from the “Spring” area and from the road running diagonally under the lawn towards the lowest branch of the Ornamental Pond as shown in “Lost Springs of Bath”.[2]

1.2.2 Previous known use of the area

The area that makes up the Park was previously part of the old Commons of Bath, including sections of Middle (Ring) Common, Lower Common, Further Common and Quarry Common as shown in the earliest known map of the area by Thomas Thorpe from 1740[3] (Figure 1.3). The surveyed area is marked in the inset.

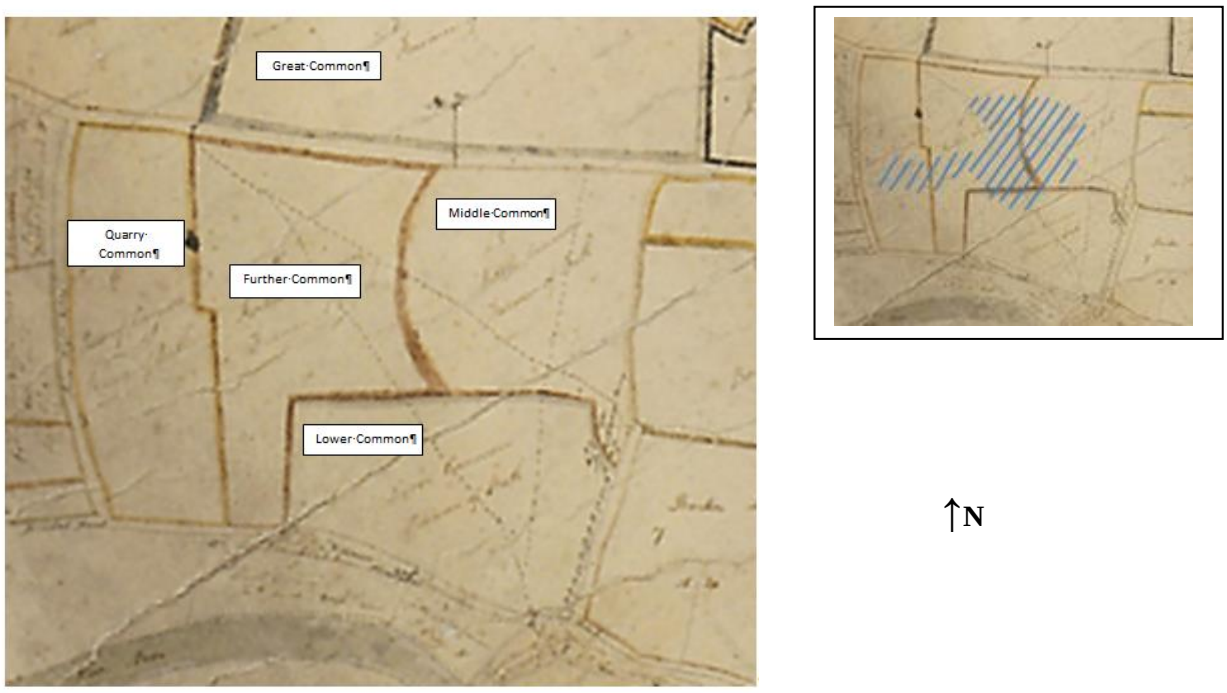

Figure 1.3 The earliest map of the area (Thorpe 1740) with the area surveyed here marked in the insert
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The Royal Victoria Park was created to include these common lands in 1830[4] as shown in Figure 1.4.[5]

Figure 1.4 A map of the area from 1856 with the area surveyed here marked blue in the insert
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"Medieval Bath Uncovered"[6] describes how this land in earlier times had been part of an area that had alternated between being royal land and land granted to the Church from the 7th century onwards. In 1204 the area was described as a cooperative open field system with a mix of arable and pasture with rights to commons by the free citizens of Bath. The Commons

agreement from 1617 was made when the Recorder of Bath stated that "the citizens ought to have and enjoy the common as claimed", when the west field (92 acres including this area) was described. These common fields were "for the use and enjoyment of the free burgesses inhabiting the city and should remain for ever." Over time the land had become a commercial agricultural operation with the freemen benefitting from the rents from leasing it. "Stuart Britain"[7] describes how the "scavenger of the common" collected the night soil from the city which was spread across the commons area as fertilizer using the "Town Plough". Another commercial activity within it was the provision of stone from the quarry for road building and agricultural use.

By the 1700s John Wood the elder described it as also being an area of recreation for the city including a circular route 600m in diameter for horse riding, named after "The Ring" in Hyde Park.[8] The current Park was then created in 1830 as a place to provide a major extension to the leisure facilities available in the city, and to provide a decorative and instructional area. While the Freemen of the City had continued the right to their share in the income of the Commons, the Corporation were the Trustees, so the current Park agreement was made with them.[4] The initial, mainly carriage-way-related, works for the Park's creation took place in just over a year when it was dedicated to the 11-year-old Princess Victoria following her visit to Bath.

The facilities developed over time. The Gothic farmhouse is dated 1831. The arboretum in The Dell was created from the old stone quarry in 1837 and a Botanical Garden was first planted in 1840, with the current version being created in 1886.[9] This area includes the site of the demolished Park Cottage, which was the residence towards the end of his life of William McAdam.[10] He, along with his famous grandfather John Loudon McAdam, had held the appointments as surveyor of roads in the Bath area and, the tradition is, constructed the roadways in the Park.[11]

The Ornamental Pond to the south, before its expansion, had been called the Fish Pond. It is not marked on the Thorpe map.[3] This pond was considerably extended into its multi-lobed shape including a bridge and an island, in1878.[5] To the northwest of this Pond a shallow toy boating lake was later built, terraced below a large wall.[12] This facility was removed in the 1970s.

The Park's use had originally involved subscription usage, and the public access to the areas has increased over time. The ownership had transferred to the Corporation by 1879, but was still run by the Park Committee until this was taken over by the Corporation in 1921. Over recent years the Park has continued in approximately its current form, with the regular and many arrangements for its use, including circuses, fairs, large and small flower and other shows, film, musical and theatrical performances, eating, drinking and dining occasions, balloon lift-offs enabling the general enjoyment of the facility by the general public. Many of these activities could well have left remains that are part of the Park archaeology. One was in 1873 when it was used by the Royal Horticultural Society (RHS) for a major regional flower show.[13] The plan of arrangements is shown in Figure 1.5. It can be noted that in this map there is another pond near the position of the "Spring" area at the top of the area. We have used this along with other plans to help us to interpret the results from our work.

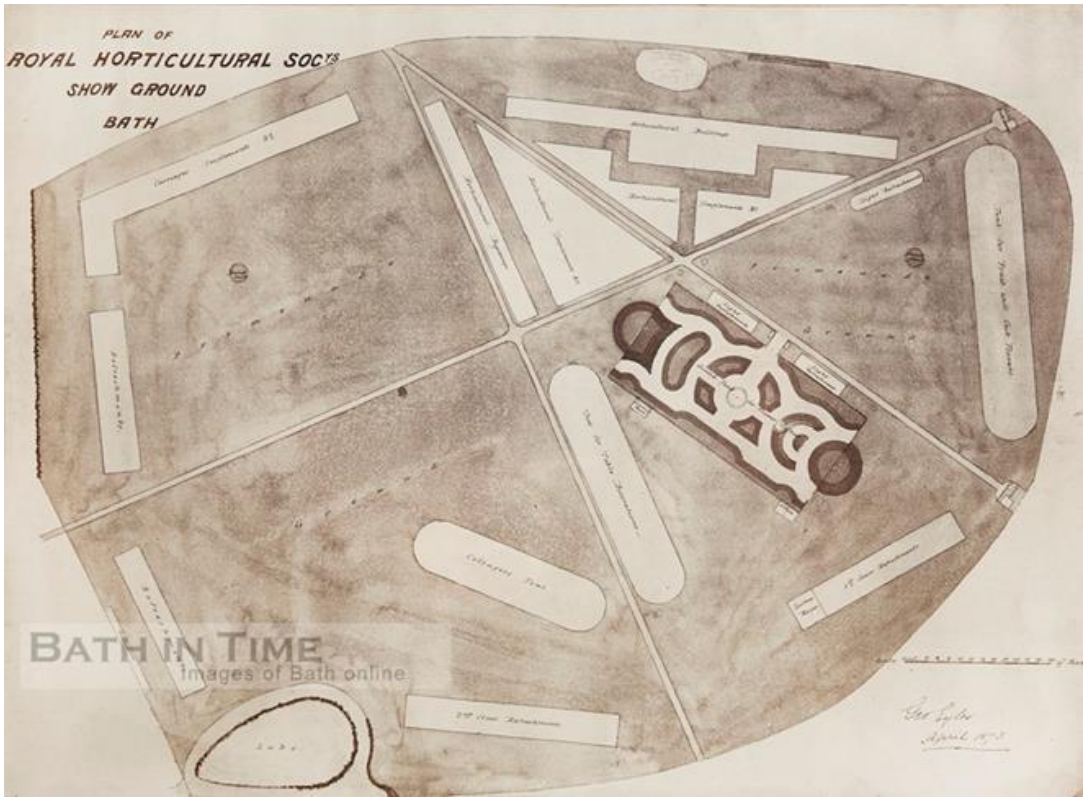

Figure 1.5 RHS showground 1873[13]
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Another major use of the Park was in 1909 when the Bath Historical Pageant performance was held there.[14] In Figure 1.6 the plan of the arrangements[15] shows most of its structures to have been built in what is now the Botanical Gardens area, with only the standing enclosure and part of the extended stage and some facilities tents in the area surveyed here. In this plan is a pond drawn to the NW of the Lake.

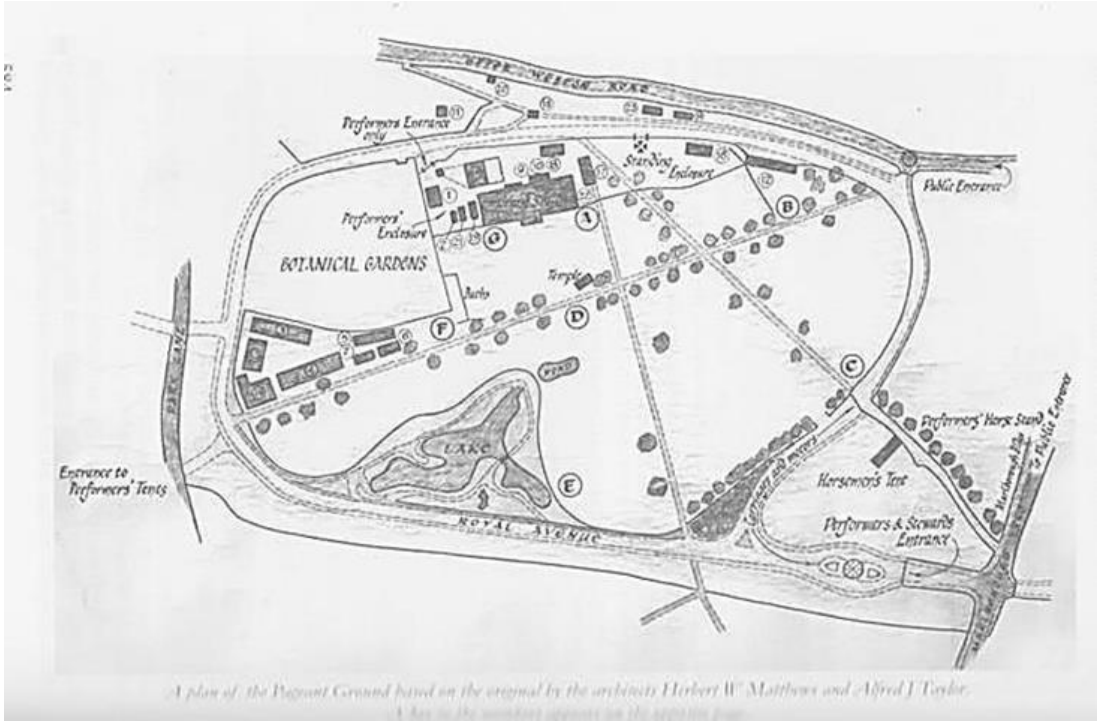


Figure 1.6 Bath Pageant layout 1909[14] **with acknowledgement to Akeman Press archives**

1.2.3 Earlier developments in this area

Towards the north up by the Lansdown road, John Wood the Elder described a group of three large stones known as Sols Rocks.[8] Other standing stones are shown on the local maps. Just to the east side beyond this area excavations have shown there was a group of standing stones in the land now the Ring Common allotments behind Marlborough Buildings. Here the group of four large buried stones was detected in 1985, under the level ground towards the top of the area.[16] Two of them were described as "large blocks of rough limestone set deep into the clay and bearing marks on their surface to suggest that an original 'standing' portion of each was broken deliberately, some time in their past". The section at the south end of [grid] 11 showed that the stones pre-date the 17th century depositions." Nothing further is known about the date and origin of these.

Remains from prehistoric times onwards around Bath are shown in many burial and other sites there, including on the hills looking down on it.[17] These include the Mesolithic and Bronze Age through to Roman remains that were found in the lawns in front of the Royal Crescent, as reported following the Time Team investigation.[18]

There were several Iron Age settlements close by. Down the slope from this area, under the Lower Common allotments, there are the remains of Iron Age round houses, which were excavated below the remains of significant later Roman developments.[19] Up to the northwest, on the slopes of the golf course in High (Great) Common, geophysics has indicated the remains of a Romano-British farmstead which may have been preceded by an Iron Age dwelling.[20] This is close to the remains of a large Iron Age settlement to the north near the Bath Spa University site.[21]

There were Roman finds unearthed in the formation of Royal Victoria Park.[22] A group of these became part of the collection of the 4th Duke of Northumberland and are in the Alnwick Castle collection.[23] Some of these items are described as being from burials and would be likely to be beside the Roman roads across this area, as described by Scarth.[24] Haverfield also wrote "It may be proper to add here a reference to the finds made in 1829–32 in forming Victoria Park. These included a considerable variety of pottery, mostly jugs, flasks and pitchers of common ware, and some fibulae, bronze rings and other small objects. They do not seem to be sepulchral, and may be connected with some vanished dwellings." We have no detailed information about the sites of these discoveries, with Haverfield marking on his map a single X? (X = miscellaneous) in the Park area to the south east, south of the Royal Crescent. Previous searching for the small finds was not successful.[1] It has been noted earlier how short the time of creation of the Park was and this largely involved the construction of the carriageways.[5] No information has been found about any archaeological investigations at that time, but excavations for the roadbuilding could have disturbed any archaeological deposits, as could digging any foundations for the two residences. It is usually assumed that the Roman road towards Trajectus and Abona takes the course of Julian Road and the Weston Road and would have crossed the Roman road that Time Team confirmed to continue a direction southwards towards the river from behind the Royal Crescent.[18] To the north, behind the Royal Crescent, the investigation by Time Team has added to earlier information on known Roman habitation and activities along the area of the road there (Julian Road).[25]

Some of our earlier geophysics results, together with other hints and indications, could be interpreted as tentative evidence for early Roman fortification sites, as has been suggested by many authors[e.g.26-28] to have possibly existed in this area. Results from this project were also considered to see if they might add to this suggestion.

1.3 Programme

The geophysics work was completed by the several teams of volunteers from BACAS in four sections: (A) 29-30 November and 6,13,20 December 2016 & 7-8 March 2017; (B) 8,15 November 2017 & 20-22, 27-29 February 2018; (C) 11-12, 18-19, 26-27 September 2018 and (D) 5-7, 12-14, 19-21 & 26 February 2019.

1.4 Scope

This survey followed our previous geophysics projects to the south of the Royal Crescent to further contribute to increasing the knowledge of the history of this part of Bath. The techniques we used are non-invasive and non-destructive and provide no direct dating evidence. The results we obtained continue to require cautious interpretation, but hopefully this report will help towards this in the future.

Any additional information and suggestions that can be added by readers of this report will be much appreciated by the authors.

2 Method

2.1 Gridding

The survey area was laid out in 20 m grid squares, as is standard BACAS practice. Starting points (0) were set up, as described in Appendix 1 and delineated along the pathways as shown. Subsequent grid squares in all except the last sectors were set up using tapes and Pythagorean triangles based on this. The last section used the posts next to the pathway continuing from Cow Lane to set up its direction as shown in Appendix 1. Grid north was 5° east of compass north. Instruments were walked in (grid) north-south traverses working across the field.

2.2 Twin probe resistance measurements

BACAS used two twin-probe resistance meters: Geoscan RM15D (black) and TR/CIA (silver). Both look similar and use similar principles, but have significantly different logging sequences. With 0.5 probe separation on the frame, maximum penetration depth was between 0.5 and 1 m.

The RM15-D twin probe resistance meter was set for taking readings at 0.5 m intervals, 1 m lines (800 readings per 20 m square), zigzag data logging, automatic triggering, 0.5 s averaging. It was set to allow readings up to 200 ohm.

The TR/CIA twin probe resistance meter was set to 40 readings per line, 20 lines (800 readings per 20 m square), triggering ‘on insert+LCR’, 0.5 s averaging. Although a zigzag pattern was walked, the data were sorted to lines of parallel direction. It was set to allow readings up to 200 ohm (0.1 ohm resolution).

2.3 Electrical resistivity pseudosection profiling

An additional approach using resistance was to use the TR/CIA resistance meter for resistivity depth profiling. In each case a 31 m line of 32 probes 1 m apart was set out along the line of the survey and a profile taken using probe separation measurements of 1 to 6 m along the length. This provided a vertical profile through the ground, down to 3 m depth.

2.4 Magnetometry

The magnetometer used was a Bartington 601-2 dual fluxgate gradiometer, set to take four readings per metre along traverses one metre apart, giving 1600 readings per full 20 m grid square.

2.5 Software

The Bartington magnetometer was downloaded to a computer via RS232 cable via Bartington proprietary software. It was then processed using a BACAS proprietary zero-median de-stripe program before importing into INSITE for mapping.

The two twin-probe resistance meters were downloaded via RS232 link and BACAS proprietary software and then imported into INSITE for processing and mapping.

Resistivity profiles were downloaded from the TR machine via RS232 link, reformatted using TR proprietary software and processed using RES2DINV software full version.

2.6 QGIS analysis

Our society benefitted greatly from a course in management of geographical data by Rebecca Bennett of PTS for BACAS in May 2016. QGIS analysis was used in manipulating the publically available data form the Environment Agency using differential hill and other shading as described in the captions of the images.

2.7 Constraints

Generally the work was in fine weather, though very cold for some periods in the winter time. The work carried out at the western end of the Park (Project C) was preceded by a period of very hot, dry weather, and the resistance results show the effects of this.

One major constraint for the project design was the need to remove the stakes marking the grids at the end of each day, so they had to be reset the following day. We feel the results show the necessary consistency for their amalgamation and interpretation in spite of the inevitable errors in resetting the grid.

Access was sometimes restricted by landscaping and flora and structural developments in the Park.

3. Results

3.1 LiDAR data analysis of the area

An image derived from LiDAR data showing this Park area is shown in Figure 3.1 and features referred to in the text are marked in the lower image. The data used is from the Environment Agency Digital Terrain Model (DTM) surveyed at 1m.

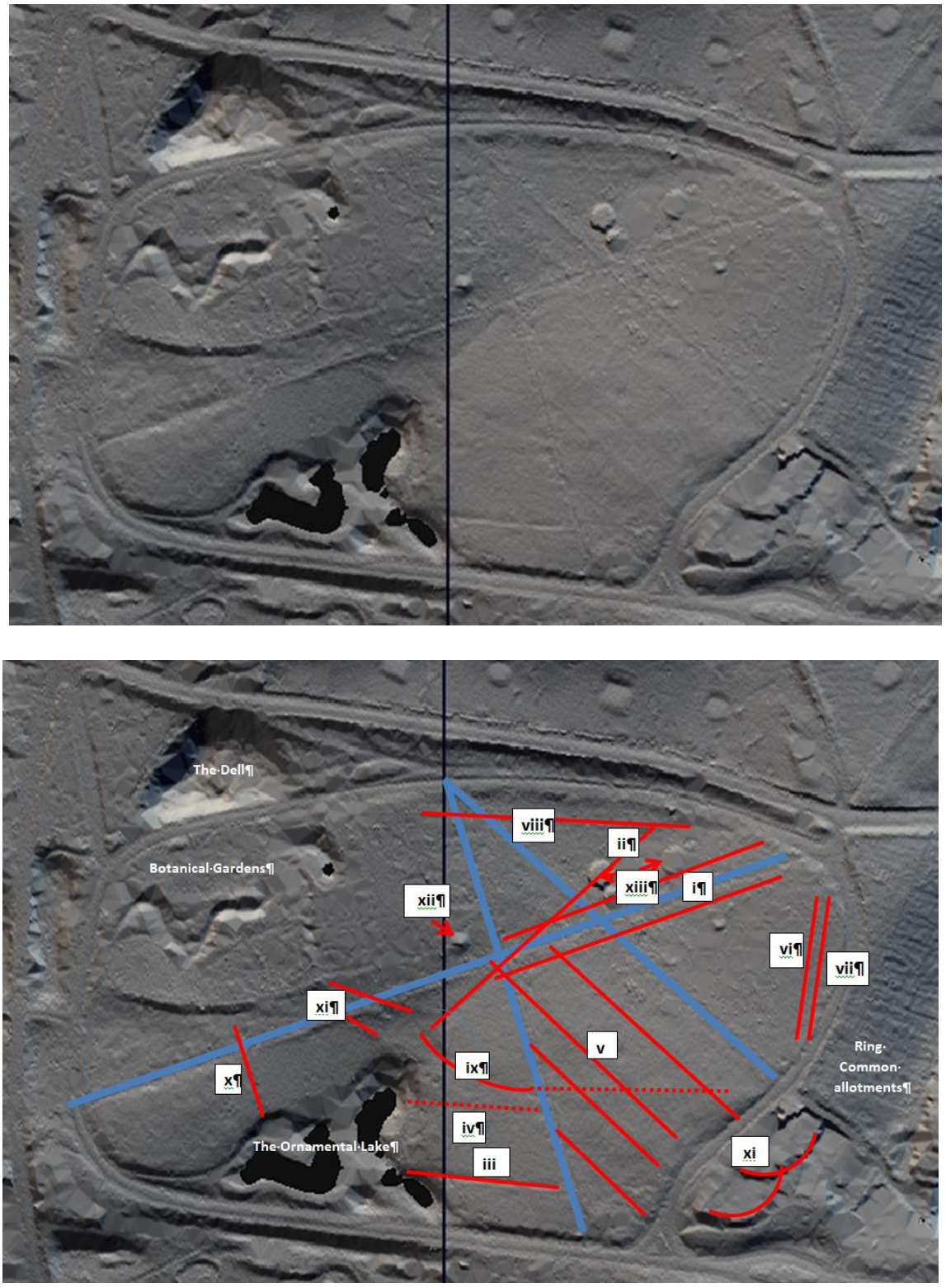


Figure 3.1 Processed LiDAR image of the section of the Park ST7365&7465_DTM_1m_HS_A20_H15_8bit with features discussed in the text marked in the lower image

Note should be taken that the emphasis due to hill shading (HS) shown in this processing method gives a considerably enhanced emphasis of small differences in height. Comparison showed that similar differentiation in the ground was provided by other QGIS analytical methods. The blue lines in Figure 3.1 mark the pathways across the Park, but along with these there are many other mostly linear features elsewhere that may indicate the results of past activity. Several of these observations will be dealt with in further discussion and analysis.

The pathway marked ‘i’ has parallel dipped elongated features along each side of it. Line ‘ii’ indicates a channelled route which comes from the “Spring” area at the top of the image running towards the Ornamental Pond. A further elongated slightly channelled feature ‘iii’ runs along near the base of the section which appears to correspond to the boundary line between Lower Common and Middle Common, as indicated by the arrow in an overlay of the Thorpe map[3] outline (Figure 3.2) on the LiDAR map. This overlay is not completely satisfactory as there is not a good coincidence of the current road and river. However useful information can be gained from this. There are no corresponding border-type indications in the LiDAR for the boundaries between Ring (Middle) Common, Further Common and Quarry Common compared with feature ‘iii’. Line ‘iv’ in Figure 3.1 .marks a linear dipped feature parallel to line ‘iii’ but this does not correspond to any boundary in the map.

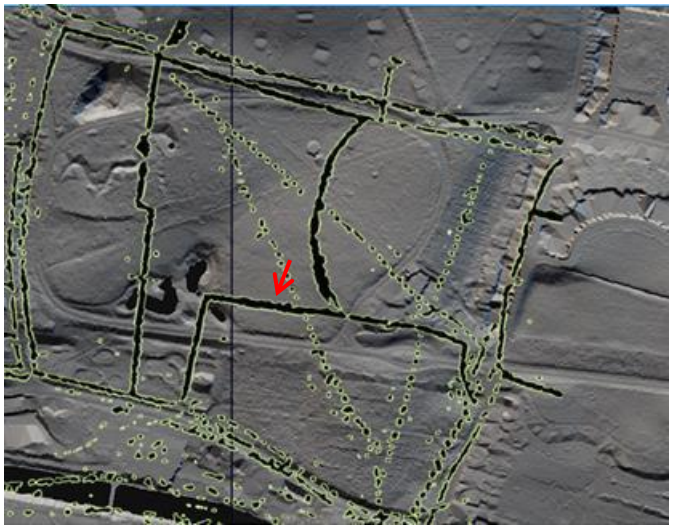


Figure 3.2 The Thorpe map outlines (Figure 1.3) overlaid on the LiDAR map from Figure 3.1

The linear features ‘v’ are parallel indications in the one area in this part of the Park that was set up as allotments in WW2 (area A in Appendix 1).[29] The plots were arranged at right angles to the lines and so they may well indicate pathways between them. These plots may also have given rise to other faint patterns across this section.

Features ‘vi’ and ‘vii’ mark a clear double low ridge running along the eastern edge of the area, and ‘viii’ is a ridge feature parallel to the northern edge. ‘ix’ is a slightly ridged curved area that might be extended further across the Park. Items ‘x’ and ‘xi’ mark linear indications to the west of the area. The feature marked ‘xii’ is the foliage and compost storage pile in the Park.

The arrows at ‘xiii’ mark two lightly raised circular areas in the grass. QGIS profile analysis was done across the more westerly one and results were obtained, demonstrating a flat area at

0.5-1m height about 12m across as shown in Figure 3.3. This was investigated further using resistivity profiling (see Section 3.3.6).

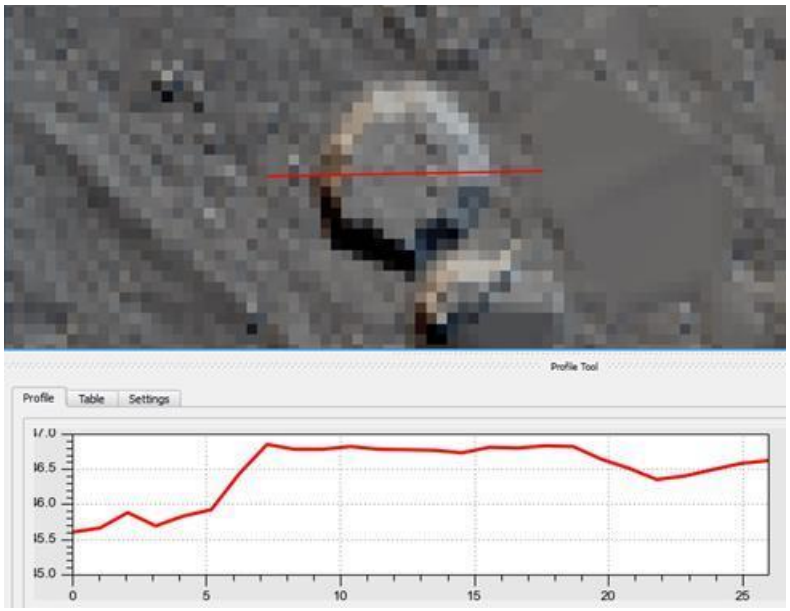


Figure 3.3 Profile analysis of LiDAR data of feature 'xiii' using QGIS red line marking profile W-E

The areas marked 'xiv' are situated inside the B&NES Council glasshouse area across the roadway and indicate two curved raised edges that correspond to the current arrangements on the site. Further QGIS analysis was done in this area to provide a profile crossing the rounded boundary areas. This shows two possibly overlapping terraced areas at 1.5m height difference. The lower one surrounds the car park, and the upper around the glasshouse area, set up on the banked grassed area there before the most recent developments.[11]

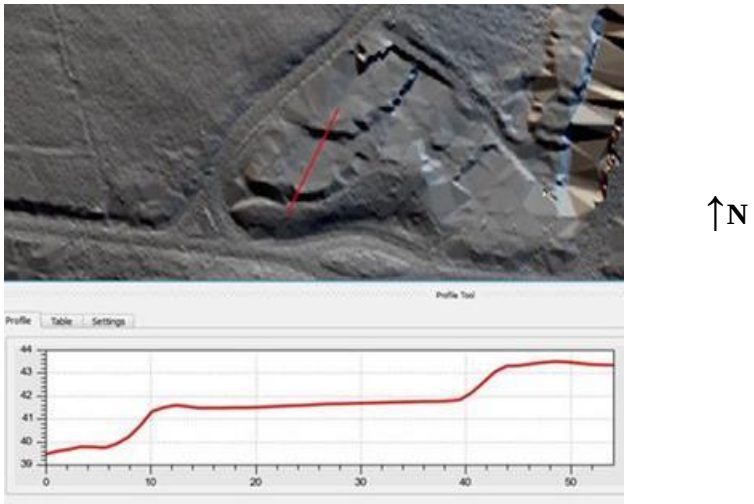


Figure 3.4 Profile analysis of LiDAR data of feature 'xiii' using QGIS red line marking profile SW-NE

3.2 Resistance survey

A resistance survey was completed over the accessible areas of the Park. These are arranged together and shown in Figure 3.5. These are arranged together and shown in Figure 3.5. The area of the survey within the Park is indicated in the first inset and distinctive areas and the features referred to in the text are shown in the second. Again a range of elongated linear features are apparent in these results.

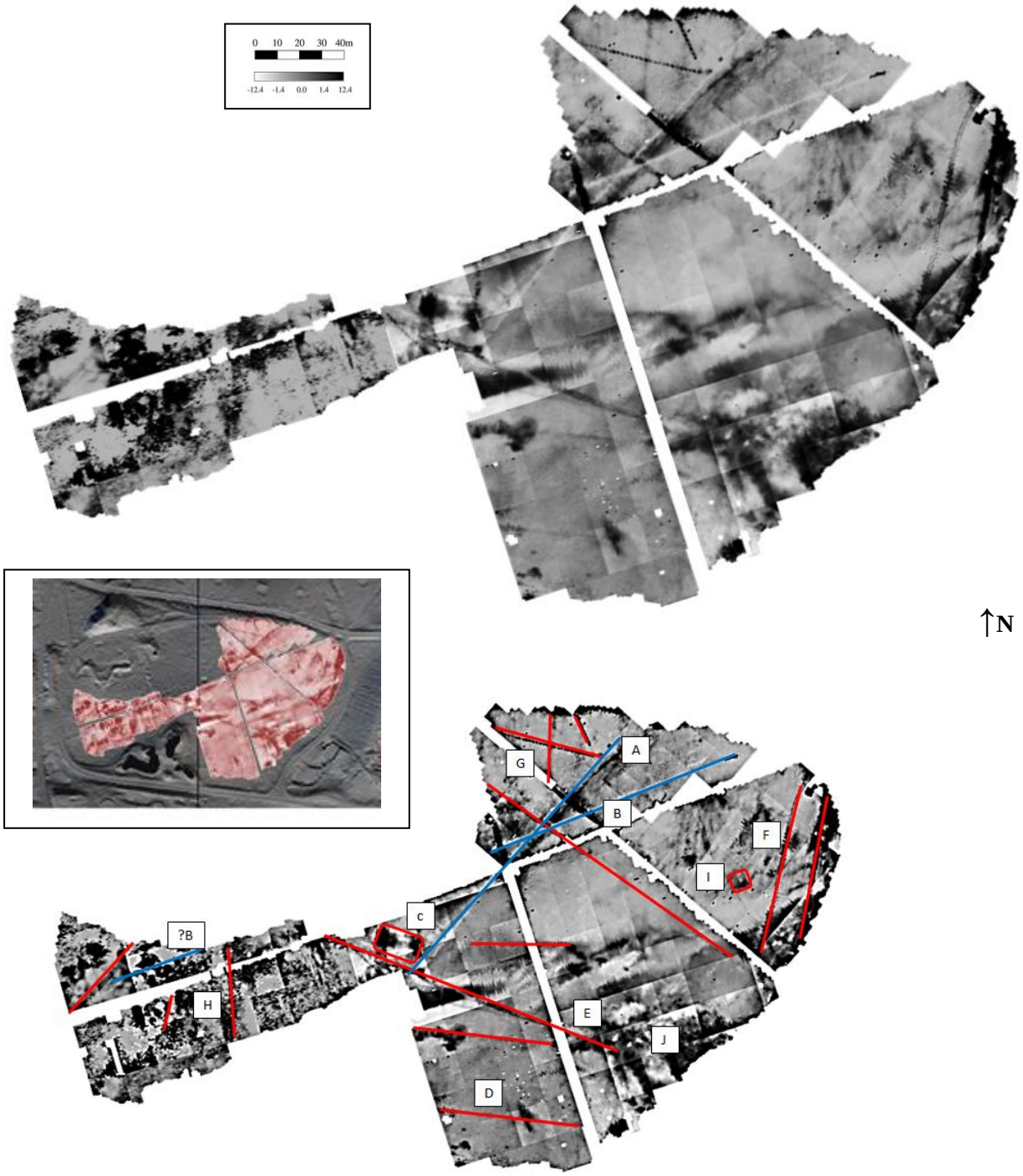


Figure 3.5 Resistance survey over the Park area

A first impression of the overall pattern of the main image in Figure 3.5 is a contrast between the resistance surveying results in the western and eastern areas. Those at the western end were completed in the driest weather and have provided a much more fragmented image. However these results are still comparable enabling them to be interpreted with the other results.

Owing to their use by the public, the gravel pathways were not surveyed over most of this survey area and can be seen as gaps in the image. However short lengths were surveyed in the northernmost section at the south end of the triangular area. Here they can be seen to

demonstrate high resistance across their widths. A cross section was also resistivity profiled and the results will be discussed in Section 3.4.2.1.

A low resistance line A marks a linear feature running from the "Spring" area at the north across the Park towards the Ornamental Pond. At an angle to this and parallel to the pathway is B, which is continued over at the westernmost section, so may well continue right across the Park area. Just north of the Pond area is a rectangular shape C that is in the position of the now-removed boating lake. Here there are high resistance areas extending from the Pond area into the lawn. One of these may be in the same area as the pond observed in the Figure 1.6 Pageant plan.

A high resistance line D runs across the lower part of the area in the position of the border of Lower and Middle Common, as shown in Figure 3.2. North of this is another parallel line with a further one further up the Park. At an angle to these (at about 15°) is a further linear feature E in the area running right across three of our worked sections for about 200m. F marks two approximately linear features over to the east, in the area of the linear feature 'vi' in the LiDAR image. G shows another collection of linear features to the north, the one running from the end of the path easterly appearing to be made of a series of intermittent higher resistance signals. These features were investigated further with resistivity profiling.

Area H is an area including several highly resistant areas and linear indications. The image of some of these with adjusted contrast is scaled up in Figure 3.6, but little analysable pattern is immediately obvious. This area was also investigated further with resistivity profiling, see 3.3.5.4.

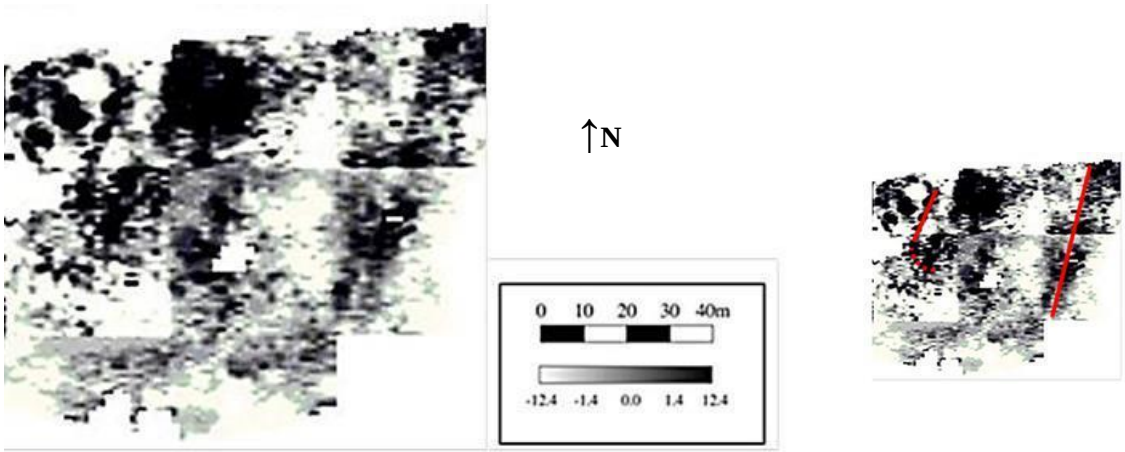


Figure 3.6 A more detailed imaging of the resistance survey over the western Park area with two possible features marked in inset

Area I in Figure 3.5 is a possibly rectangular indication which may be one of the few indications of a possible building structure in this area. This was investigated further with resistivity profiling (3.4.7.2). Marker J marks a large possibly rectilinear area showing high resistance, possibly relating to infilling at the eastern side.

Very few of this collection of differential resistance patterns give any obvious indications of their origin. Comparison will be made with further results in the next sections.

3.3 Magnetometry survey

3.3.1 The pathways and possible differential previous use of areas of the Park

Figure 3.7 shows the magnetometry survey carried out over the Park. Once again, most of the Park pathways were omitted and their course is indicated by the blank lines, and there are other blank areas around the seating and table arrangements in the Park. Some of the pathways were able to be surveyed using this technique (between areas A and B and at the north of area D), but their courses are not clearly distinguishable using this method.

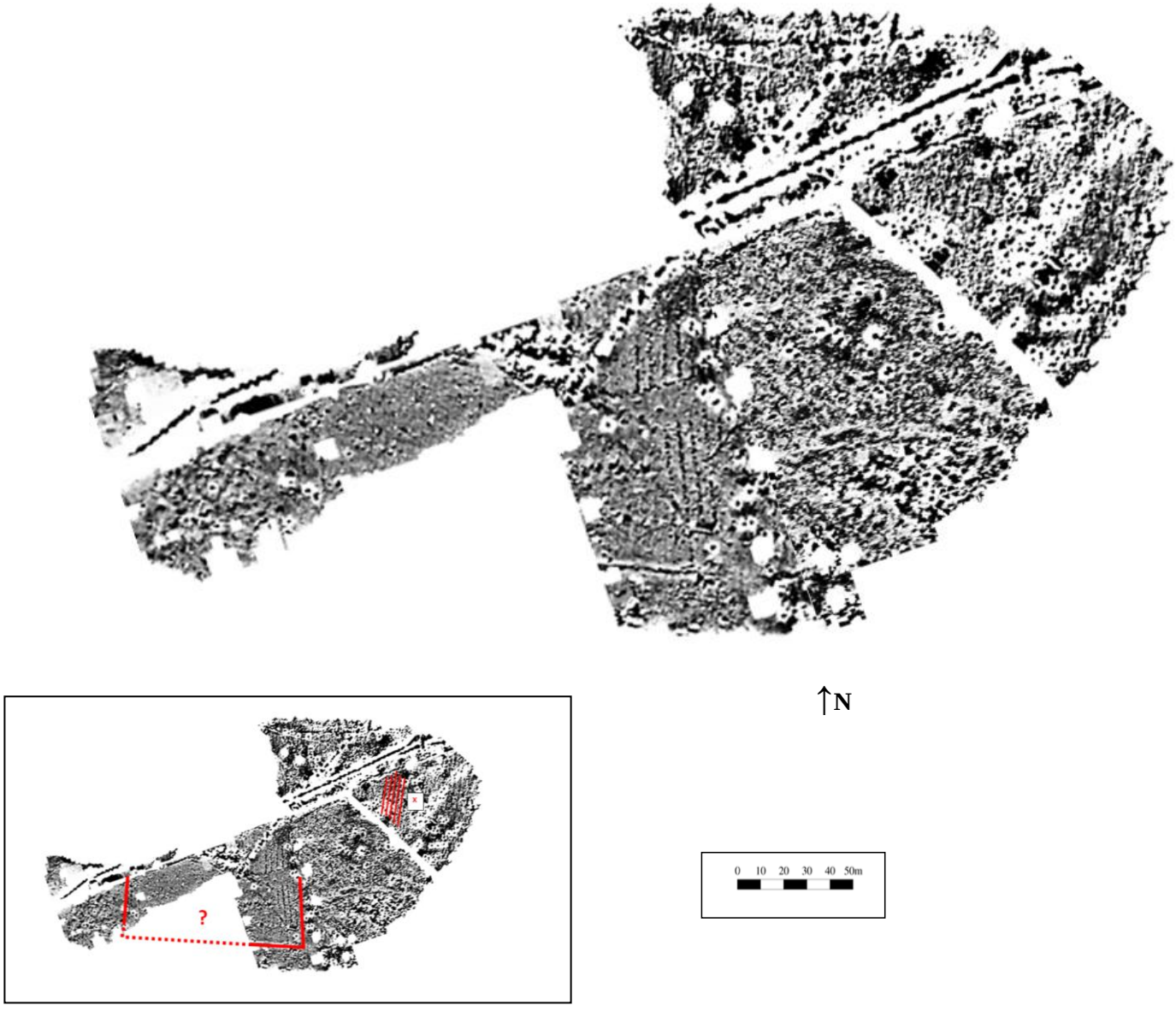


Figure 3.7 Magnetometry survey with areas referred to in the text marked in the insert

The overall pattern of responses in the image of the results is very noisy. This irregular response arrangement has been similar in our work elsewhere in the Park[1] and is due to all the disturbance and deposits of material over the many years of its use.

We have no information on differential use across the Common Fields or the Park, but looking at the gross patterns in the overall image there are differences distinguishable. The trapezoid area to the south east (A in Appendix 1) was used for allotments during WWII. Here the ground was significantly manipulated and cultivated at that time which may account for any differences with the surrounding areas as in the areas to the north and east. To the north west (X in insert in Figure 3.7) there is an overall parallel anomaly pattern about 3m wide possibly indicating the remains of ridge and furrow ploughing. Such results would be shown where the early cultivation remains have not been overlaid by modern cultivation techniques.

A further large possibly rectangular area about 160m across, showing a less variable signal density is marked in the insert of Figure 3.7 as "?". It includes the Ornamental Pond area. This area partly overlaps the cross hatched markings shown in Figure 1.2 of "Made Ground: embankment, quarry spoil and tips", but as noted earlier that is a general marked area including all the landscaping areas in this end of the Park and it does not extend as far east across the Park as this indication. Possibly it is due to a regularly shaped deposit of excavated soil or some differential deposition of something else. However, if it does show differential usage, it does not correspond to the known field boundaries. Part of its area was examined further using resistivity profiling (3.4.3.1) and will be discussed further.

3.3.2 Linear indications in the magnetometry results

As seen in the previous results there are a considerable number of linear features shown crossing the Park and more are also seen in magnetometry anomaly patterns. The features referred to in the text are shown in Figure 3.8.

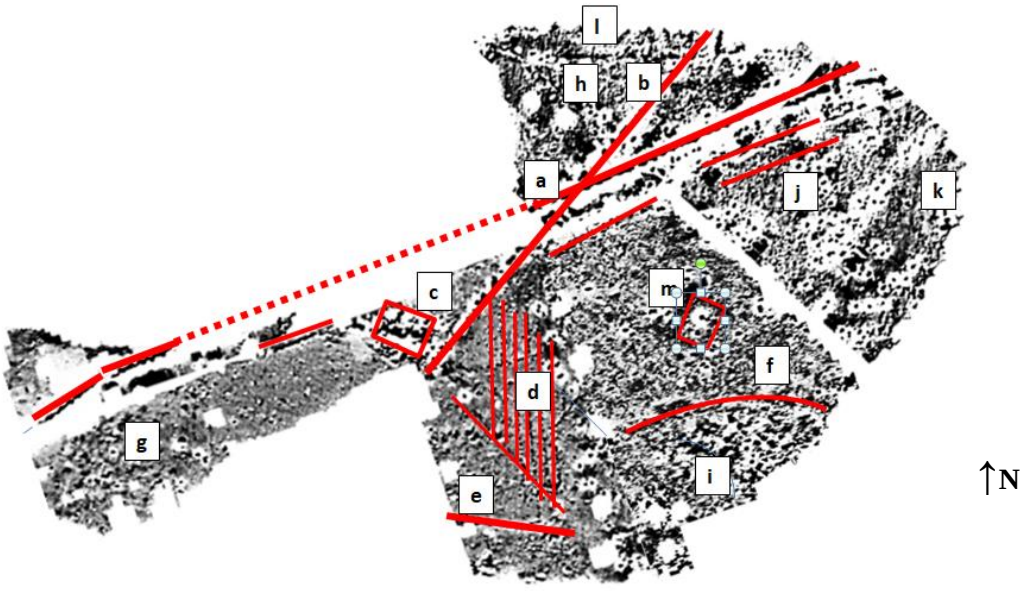


Figure 3.8 Magnetometry survey marked to show linear feature discussed below

Parallel to the main pathway and presumably running across the whole area there is the very strong ferrous-indicating linear feature (a) of probable pipe work. We have been told that a gas main was laid across the Park[11] so (a) is likely to show this. Alongside the pathway there are several dark narrow linear anomalies.

At an angle running down to the Ornamental Pond from the "Spring" area is another similar, if smaller, linear structure (b), which again probably indicates pipework. This is on the line of the known water supply to feed the Ornamental Pond. Just to the north of the end of this possible pipe by the pond is a complex area (c) which could correspond to the remains of the Boating Lake.

An array of parallel linear features, 4-5m apart, runs down the lawn to the east of the Ornamental Pond (d). They are at a right angle to the linear feature (e) which as noted coincides with the border between Lower and Middle Common. It can be seen that these linear patterns of anomalies are within the area of possibly different usage described in Figure 3.2. They were investigated further using resistance profiling (see 3.4.3.1).

There are other linear features distinguishable in the analysis of the results across the area including one curved line (f). This curved feature does not appear to continue into the next section to the east. Areas (i), (j) and (k) mark areas of higher possible activity deposits including a linear arrangement SW/NE of stronger magnetic responses across the grassland (j). Other less obvious linear features for example a darker line running across the boundary near the top area of the survey can be distinguished (l). Several of these features were investigated further with resistivity profiling in Section 3.4.

3.3.3 Other indications from the magnetometry results

There appear to be no areas indicating evidence of extensive habitation remains detectable using these survey methods. Just one distinct large (20x15m) rectangular area was indicated in the magnetometry image in Figure 3.8 which was investigated further with resistivity profiling (3.4.7.1).

Differential analysis of the results can give additional indications, and a more refined process to remove some of the responses was carried out in the easternmost section to reduce the emphasis of some of the highly magnetic difference areas. This process revealed a single anomaly, possibly a round house, as shown in Figure 3.9, marked in the inset.

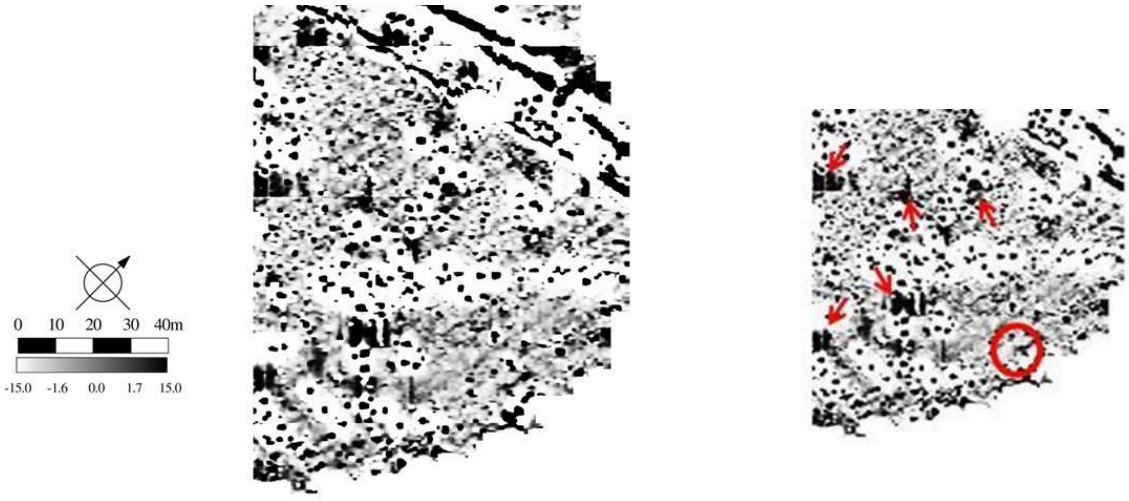


Figure 3.9 Area k image processed to reveal more detail

A linear arrangement of what appear to be deposit anomalies runs south west/north east (between j and k in Figure 3.8). This line leads to the north east entrance to the Park. In the inset to the image in Figure 3.4 there are several large anomalous areas arrowed, but there was no apparent correlation to the other survey results that might give an indication of cause or a need for further investigation.

3.4 Resistivity profiles in the different areas of the Park

As described in the previous sections several of the areas described above were investigated further to see if some of the survey results covering the surface area could be enhanced by looking at depth under the ground using the technique of electrical resistivity pseudosection profiling. For this we used the TR/CIA resistance meter along 28 or 31 m lengths. Precise details of the arrangement are in Appendix 2.

3.4.1 Map of the resistivity profiles

The map of the profiles we completed is shown in Figure 3.10. The profiles shown by continuous lines are described in this section. Their positions are described in Appendix 1 Table 1. The arrows point to the highest probe number end of the array. Further details and the images of the profiles shown in Figure 3.10 with dotted lines are in Appendix 2.

The results are described in the sequence used in the previous sections, for easier comparison.

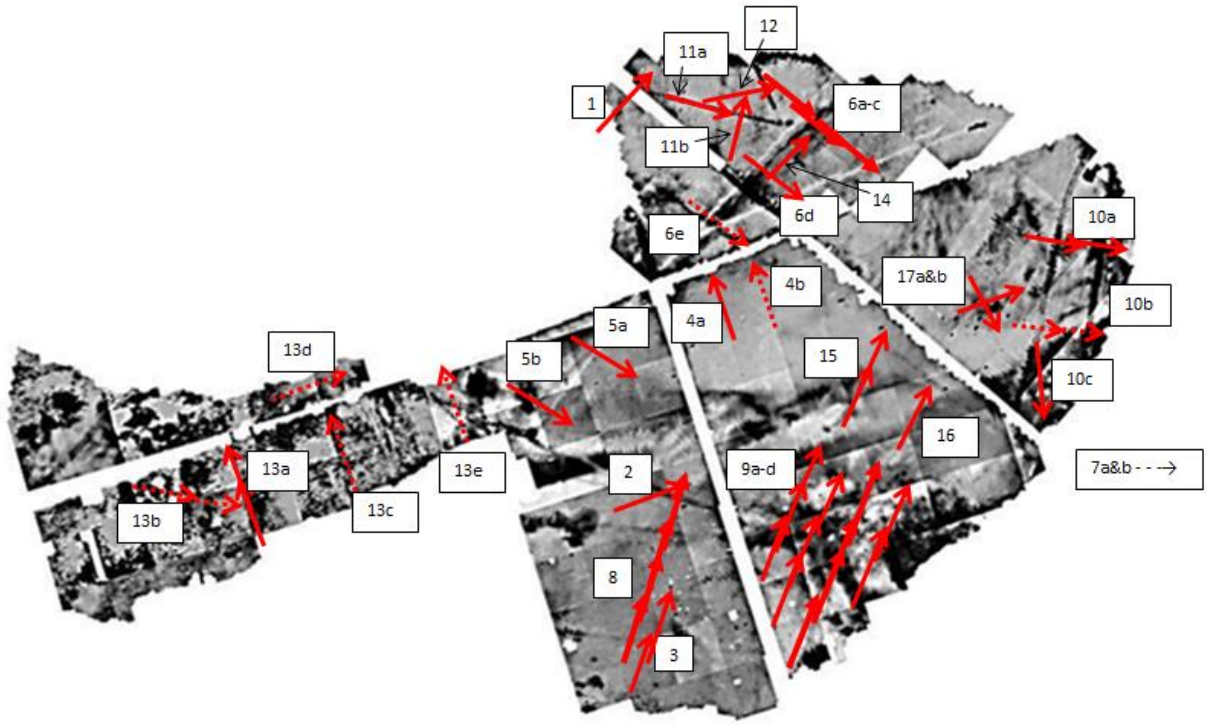


Figure 3.10 Map of resistivity profiles over the area (profiles 7a&b are in the Ring Common allotments)

3.4.2 Profiles across the pathways across the Park

3.4.2.1 Profile 1 across the pathways at the north eastern end of the section

This Profile is one that was set up to cross over the courses of the two pathways there. Differential high resistance results had been seen where the pathways had been included in the resistance survey in the northernmost section.

The resistivity profile marked 1 in Figure 3.10 was laid across the two pathways and the image showing the results is shown in Figure 3.11. The positions of the pathways are marked with the blue arrows. High resistance, as would be expected from the resistance survey shown in Fig 3.5, is not shown here, so the results indicate that this high resistance is too shallow to show).

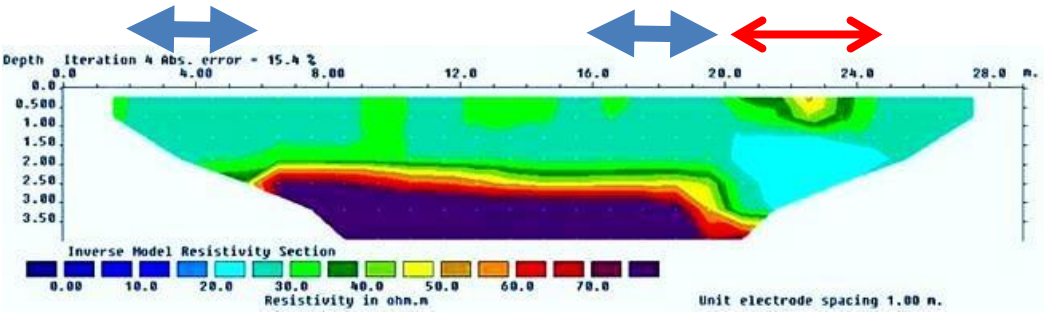


Figure 3.11 Resistivity profile SW-NE across the pathways shown by the blue arrows

Just to the side of the right hand pathway, there are results indicating an approximately 5m wide higher resistivity structure extending deeper under the ground down to 1-1.5m (arrowed in red). This has a 2m wide higher resistance area in the centre. This could indicate the remains of an earlier roadway or alternatively it could be an area of buried stone.

3.4.3 Profiles relating to the putative area of different past usage noted in magnetometry

Resistivity profiles were designed to see if further information could be obtained from sectional analysis of the area marked in the Figure 3.7 inset to add to that gained from the survey results.

3.4.3.1 Profile 2 across the parallel linear features indicated in magnetometry to the east of Ornamental Pond

The first to be looked at is the area of the array of linear anomalies shown in the magnetometry survey to the east side of the Pond (d in Figure 3.8). The profile shown in Figure 3.12 crosses this array of linear features west-east. The approximate positions of the linear features 4-5m apart are indicated with the arrows. There is a lower resistivity soil layer above a higher resistivity rocky layer below.

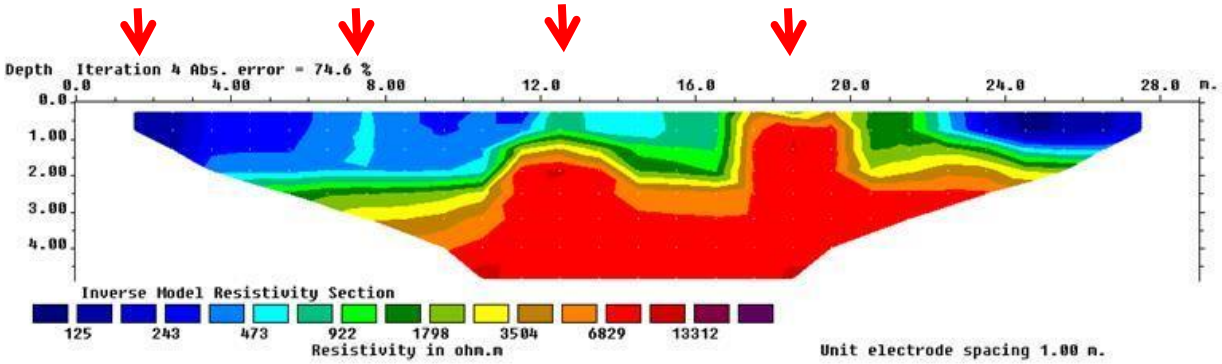


Figure 3.12 Profile 2 W-E across the parallel linear features seen in magnetometry to the east of the Ornamental Pond. A logarithmic scale has been used to emphasise detail.

The image uses a logarithmic scale. The linear version of the profile is shown in Appendix 2, where the results show a cross section of a very high resistance volume. We note that this profile was one of several taken after a very dry period. It is over 60m from the Ornamental Pond so is less likely to show a revetment related to the creation of that, and no other similar feature has been observed in our results. The profile does cross the linear feature marked as line E in Figure 3.5, and this may be shown by the higher resistivity volume near the surface from 17-20m. This feature will be discussed later in section 3.4.5.

In detailed examination of the results there does seem to be a consistent regular arrangement indicating a higher resistivity result below three of the arrows indicated by the magnetometry results (and the fourth is in the limited results at the start of the profile). Two of the indications show a narrow higher resistivity differential, extending down to more than 1.5m below the surface and are relatively indistinct, but the indication at 7.5m shows a clearer higher resistivity volume. The right hand indication continues into the higher resistivity volumes under the ground in the centre of the image. Similar high resistance results were not seen in the resistance survey. The pattern may coincide with the parallel narrow parch marks observed to appear in the grass in the very hot summer of 2018.

3.4.3.2 Profile 3 across the ditched feature in the southern part of the area

The dip running east west along the line between Lower and Middle Common is visible in the park ground, as well as in LiDAR (iii in Figure 3.1) and in the resistance and magnetometry plots. A pair of profiles was set up across it, south to north starting at the grid boundary almost at the edge of the grassed area. These results were concatenated with the heights from LiDAR data added and are shown as a single profile in Figure 3.13. A logarithmic scale is used to show the differentiation, and a linear version is in Appendix 2. The position of the very slight dip in the ground is at about 24m, shown with the arrow.

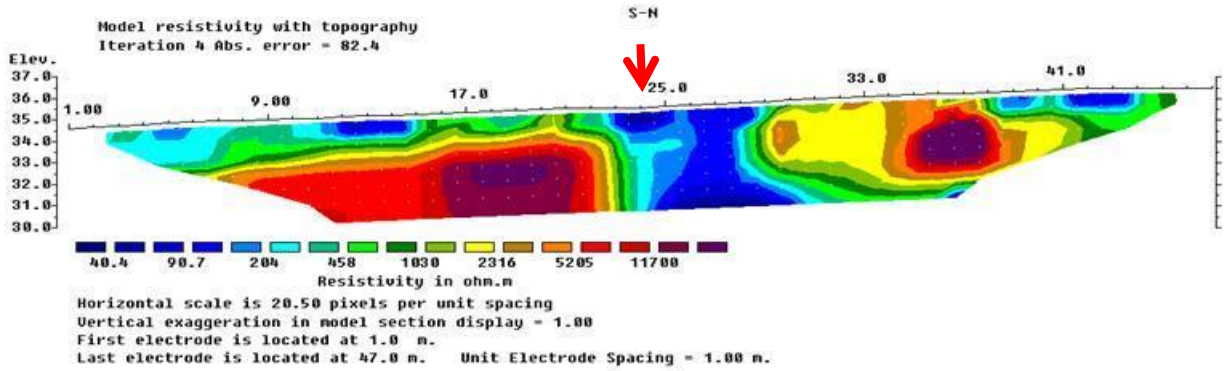


Figure 3.13 Profile 3 SW-NE across the ditched area

From these results, this ditch-like feature appears as a shallow low resistivity volume, above a deep low resistivity volume, and between two higher resistivity areas. Volumes are shown in the image to the north and south with very high results that could indicate voids. Voids under the ground are known in this area, as shown in our results south of the Royal Crescent.[1] The northern volume might appear to be a conduit, but it does not continue to the west as will be seen in Figure 3.20.

3.4.4 Observations made along the number of water courses crossing the area towards the Ornamental Pond

There is a water supply from the local springs crossing the round along various routes. The directions of the remains of watercourses and the presence of piping have been noted in the previous sections. Our profiling results have added to information on these.

3.4.4.1 Profiles 4 across the course of a further possible water course leading to the Ornamental Pond area

In our first area of investigation (A see Appendix 1) the magnetometry image shown in Figure 3.5 shows a linear darker anomaly across the top of the grids south of the long pathway across the Park. This appeared to indicate the remains of a water course running down the slope towards the Ornamental Pond. To investigate this profiling was set up across this line, south to north, shown in Figure 3.14.

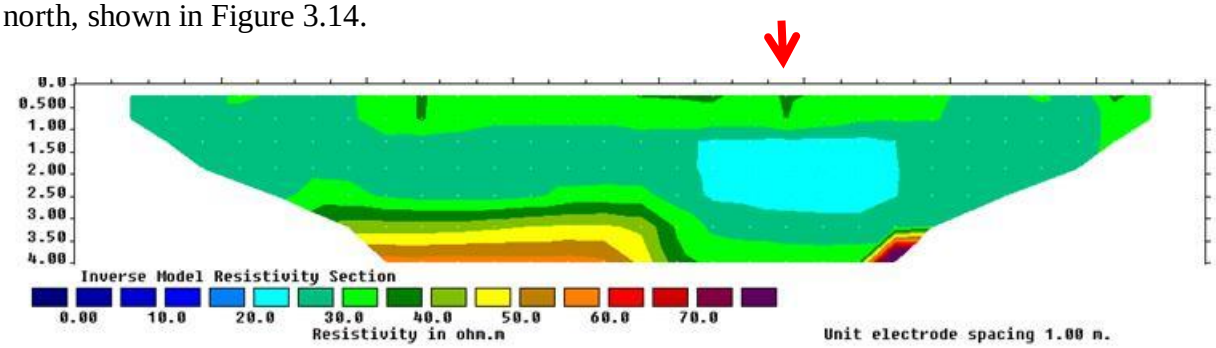


Figure 3.14 Profile 4a SN across the possible watercourse indicated in magnetometry

Here a rectangular low resistivity volume coincides with the magnetometry line, to indicate a possible previous watercourse at 1.5m depth. A parallel profile can be seen in Profile 4b in

Appendix 2, which also shows a volume of low resistivity at similar depth. This possible watercourse does not appear to have come from the "Spring" area but more to the north east.

3.4.4.2 Profile across the line of the indications of the course of an old stream towards the Pond

A linear feature that does appear to run from the "Spring" area towards the upper corner of the Pond area is shown as "ii" in Figure 3.1, A in Figure 3.5 and b in Figure 3.8. This was crossed by Profile 5a as shown in Figure 3.15.

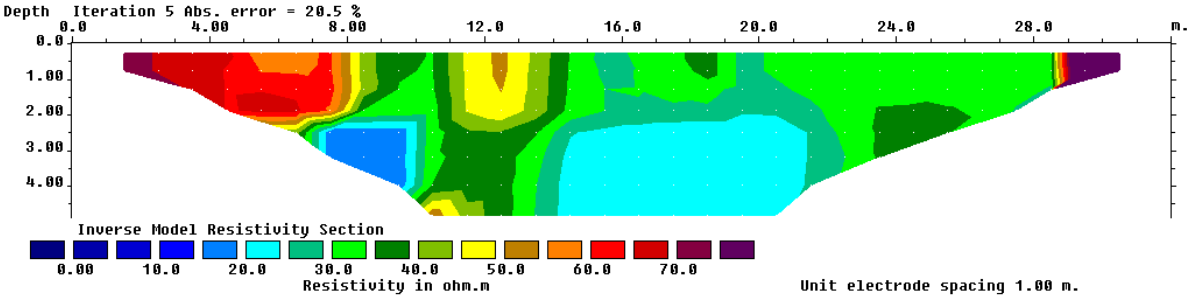


Figure 3.15 Profile 5a NW-SE to cross the SW/NE linear feature approaching the Pond

In this, at over 2m depth, from 14-21 there is a low resistance volume that could indicate the course of an old watercourse running towards the Pond area that would be consistent with the results obtained in the geophysics surveys. Towards the left hand end of the profile image at depth a possibly regular shape, about 3x2m, of low resistance is seen, which we thought might show the section of the known old culvert[11] running through the Park. There is another larger rectangular feature that can be distinguished near the surface from 4.5-8m (if a conduit, appearing filled). The possibilities of this result showing the presence of a culvert were investigated further in the next section.

Profile 5a also runs across part of the continued line of the parallel linear features that were described in 3.4.3.1. It can be noted that at 12.5m this profile does shows a similar narrow higher resistance shape extending to 1.5m under the ground, which may indicate some continuity with those features.

3.4.4.3 Profiles on the possible line of a culvert towards the Ornamental Pond area

Profile 5b was set up to add to the results from the profile shown in Figure 3.15 that could indicate a culvert running south-westwards the Park from the "Spring" area towards the Ornamental Pond. The profile in Figure 3.16 shows a very high resistivity rectangular shape, 3m across and 2m high, between 16-19m. It is at 37.5m above SL from LiDAR data and from these high resistivity results appears to be empty. The scale used here is logarithmic because of the scale and a linear version is shown in Appendix 2.

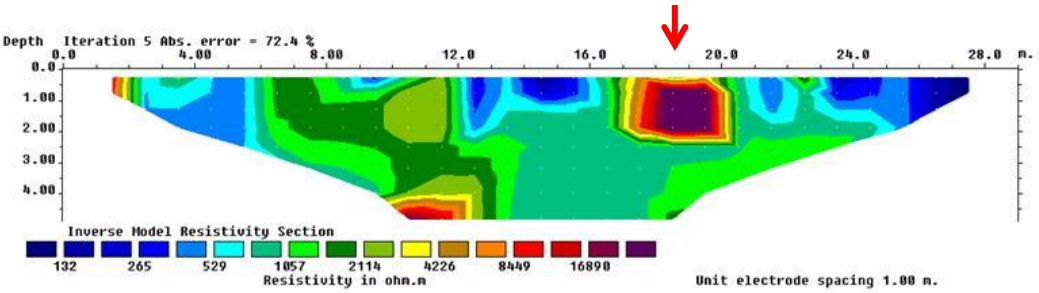
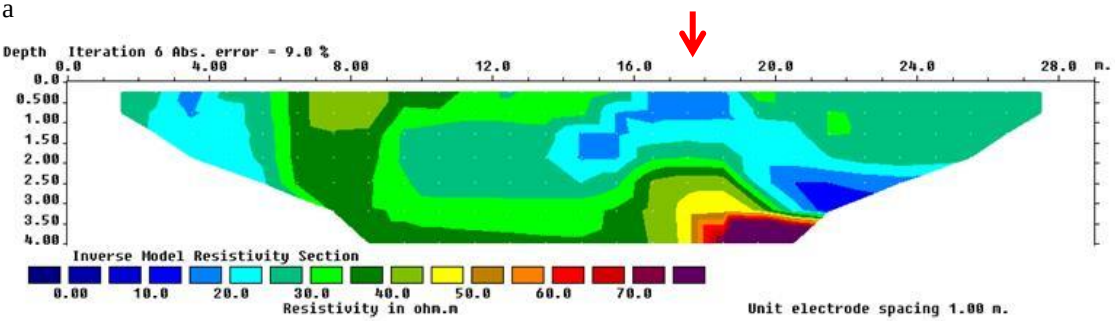


Figure 3.16 Profile 5b NW-SE to show the possible culvert near the Ornamental Pond

According to previous parks staff, a known culvert passes by the horse chestnut tree in the middle of the Park at the NW corner of area A (see Appendix). To investigate the course of this possible culvert coming down from the "Spring" area three profiles was taken across the area to the south of the "Spring" area, overlapping by 19m (Profiles 6a-c).The middle one 6b is the only one which showed any apparent culvert type shape as shown in Figure 3.17a. This is between 16-18m along the profile and near the surface, at about 47.5m height above SL from the LiDAR data. From the results shown in the concatenated profile across the three profile length this may be part of a more complex arrangement.

a



b

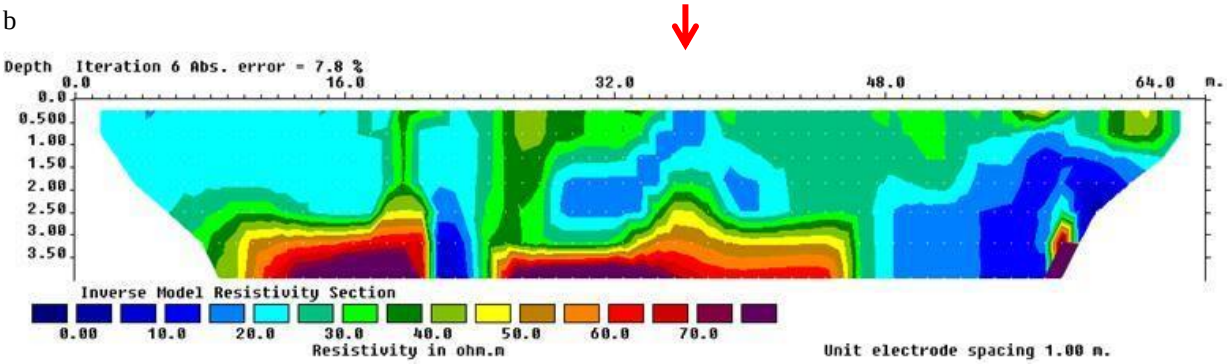


Figure 3.17 (a) Profile 6b (logarithmic scale) and (b) concatenated profiles 6a-c (linear scale) NW-SE across the line of the possible culvert just below the "Spring" area

The projected possible culvert line was followed to the south west towards the Pond. North of the path in Profile 6d there is a rectangular cross section in Figure 3.18 below the ground at about 44m height. The cross section here is 4m wide but here is higher resistance (possibly filled).

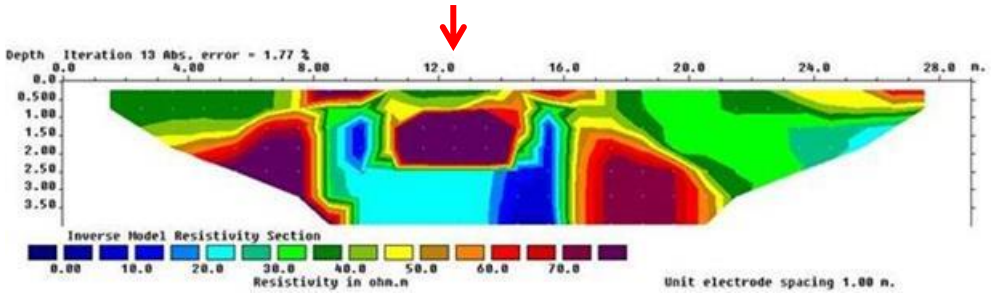


Figure 3.18 Profile 7d NW-SE across the possible culvert line near the path in the top section of the surveys

A continuation of the possible line towards the Pond is shown as Profile 6e (in Appendix 2). However this profile did not include a similar cross section. Further investigation would be necessary for any clarification of the course of this possible culvert following these results.

3.3.4.3 Profile 8 crossing another possible culvert along the allotment slope

Mud (Mad) Brook was diverted to run down the slope parallel to Marlborough Buildings.[3] According to the 1786 map[29] this brook ran close to the end of the gardens, where it now is in a culvert under the manholes at the bottom end of the Ring Common allotments shown in Figure 1.1. We had the opportunity and permission to do a small amount of profiling in these allotments and Figure 3.19 shows a line of a concatenated profile west-east down the slope, 5m south of the southern edge of the allotment plot block. The position of Mud (Mad) Brook is at the right hand end of this within the low resistance area, but no details can be seen at this end of this profile. However in these results there is another 2.5x2.5m wide possible culvert volume about 15m to the west of the present route under the slope of the allotments, appearing as a regular high resistance volume, about 10m across.

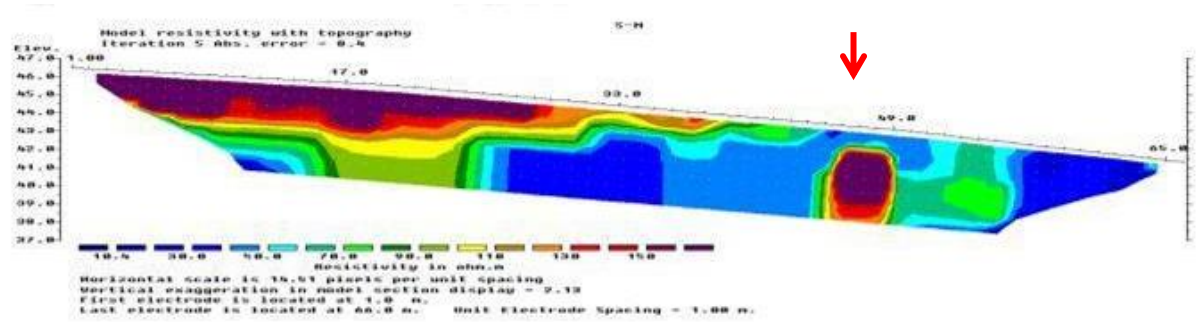


Figure 3.19 Profile 7a NW-SE concatenated profiles across the allotments 5m to the south of the plot area

A second profile, shown as 7b in Appendix 2, was taken parallel to the south 5m from Profile 7a. This indicates that this high resistance volume appears to continue, but shows a pattern that may indicate a fork in the feature.

It can be noted that the profiles in this section were originally surveyed to investigate the possibility of any structural features continuing into the allotment area. Higher resistant material is shown there at the left hand end in both profile images the border of which could indicate some sort of infilling. Below this between 16-26m is a higher resistant volume indicated and another to the east including the possible culvert.

3.4.5 Investigations by profiling of the several long linear features across the area

There are indications of several long narrow linear high resistance features running from a few tens of metres to crossing the whole accessible area. In order to look at the nature of these we used resistivity profiling as follows.

3.4.5.1 Profile 9 SN to east of Ornamental Lake crossing three linear features seen in resistance survey

There are three strong linear higher resistance features in Figure 3.5 crossing under the ground to the east of the Ornamental Lake. The first is the ditch line as profiled in Figure 3.7 (D in Figure 3.5). Parallel to that is another high resistance linear feature 45m to the north and a third at an angle of about 15° (E in Figure 3.5). This latter line may have been observed in Figure 3.12 as a high resistivity volume 3m wide near the surface. Three profiles were run south to north across these lines to the west of Profile 3, shown as Profile 8 in Figure 3.20 concatenated as a single profile with topography. The high resistance indication positions are shown by arrows.

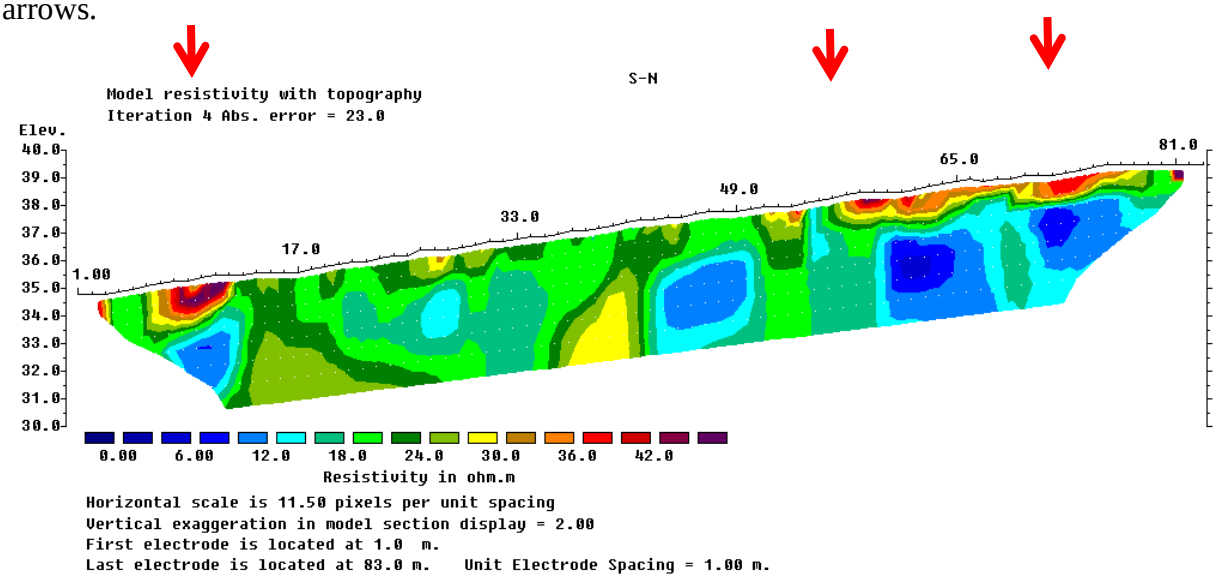


Figure 3.20 Profile 8 concatenated profiles running S N to the east of the Ornamental Lake

Differentiation of the structure of the shallower ditch shape appears to be filled in this profile corresponding to D in Figure 3.5. The two other linear features, the parallel line to the north and line E may be caused by the higher resistivity results near the surface at 54 or 57m and 72m along. However these are not well differentiated in the profiling and any possible remains are only 1m deep.

In consideration and comparison the edge of the higher resistant layer at 57m may be coincidental with a continuation of a proposed linear feature that we had detected using profiling to the south east. Here an edge of higher résistance volume was studied using a series of parallel profiles. These followed the edge of a higher resistance feature that appeared to possibly extend from one of the rounded areas (xi in Figure 3.1) as shown in Figure 3.21. This red line that follows the edge of a higher resistivity volume would if continued, cross a linear version of the profile from Figure 3.20 at the edge of a similar shallow high resistivity volume.

The relative ground heights from LiDAR are at 43m above SL at the rounded area, about 41m at the four-profile array and 38m at point 57m.

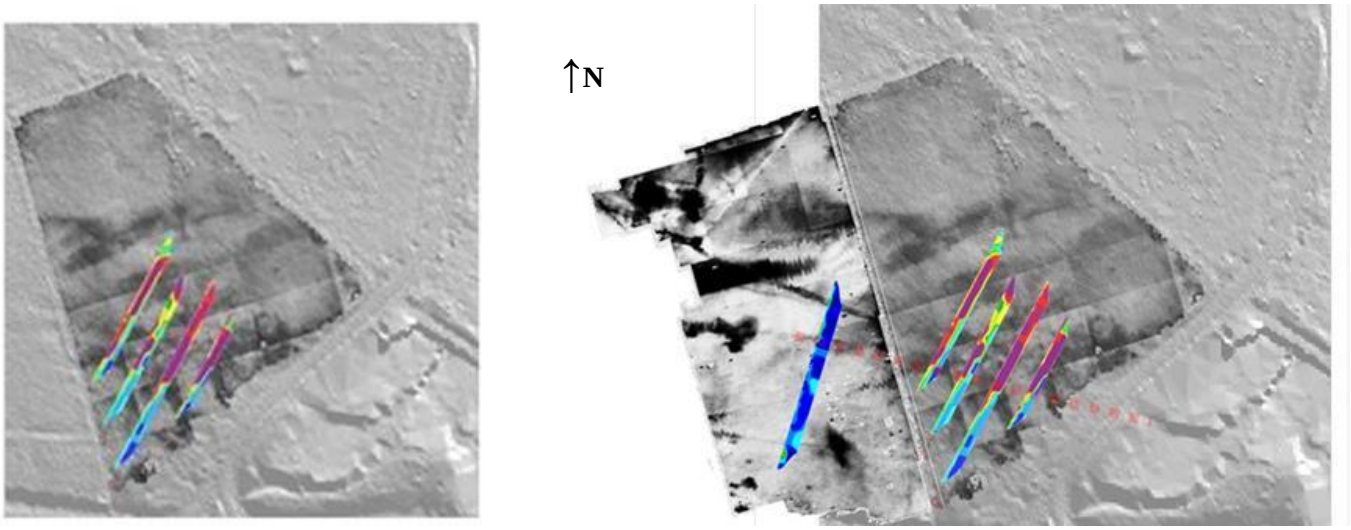


Figure 3.21 Indications of edge of high resistance feature possibly extending from one of the circular terraces observed next to the Park area with projected line and a linear version of profile 9 from Figure 3.20 (see Appendix 2) shown in the right hand image

3.4.5.2 Characteristics of linear features in the easternmost survey area Profile 10

Parallel high resistance lines can be seen in the easternmost section with two raised linear features in the ground and in LiDAR and in the resistance survey (vi and vii in Figures 3.1and E in Figure 3.5). Concatenated profiles were run across these to investigate the nature of these.

The two almost parallel lines were observed in the resistance, with the easternmost one possibly following the indications in the LiDAR in Figure 3 of the linear feature down the east of the area (E). The concatenated profiles are shown in Figure 3.22 and the resistivity pattern appears rather complex. The linear features are indicated at about 13 and 27m. Two raised areas of ground (vi and vii in Figure 3.1) were observed in the field to run cross the profile at 21 and 31m. A pattern corresponding to this in Figure 3.22 is not clear, though the two features that make up the double line in the results may be indicated at 12.5 and 15.5 in the logarithmic scale profile (10a) seen in Appendix 2. There is a clear indication for the other linear feature at 31m which shows a higher resistant volume. There may also be a culvert/ditch-like feature in the middle of the profile.

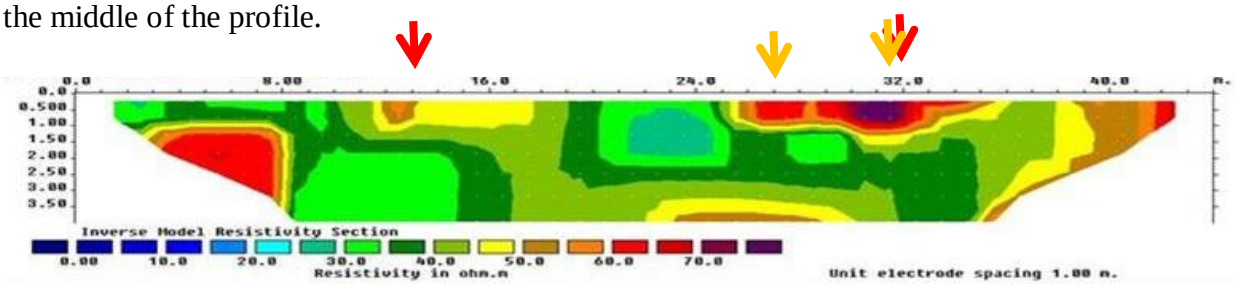


Figure 3.22 Profile 10 W-E across the linear features at the easternmost side of the surveys

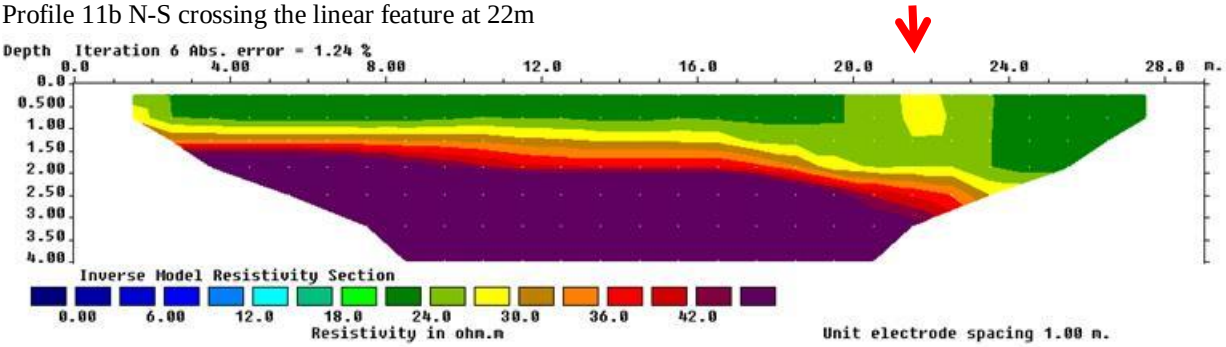
The parallel concatenated profiles to the south of this (10b) are shown in Appendix 2. This second line was set over hard standing toward the road at the eastern end which has complicated any possible interpretation.

To the south of these a third profile (10c) was run west-east across the grassed area, designed to investigate the possibility of any development extending there from adjacent sections (but not expected to cross the linear feature described above). It has a ditch-like feature in the middle between two deep high resistance volumes and with the lack of any further interpretation is shown in Appendix 2.

3.4.5.3 Profiles 11-12 linear features at the northern part of the survey area

There is a further collection of apparently unconnectedly arranged linear features in the area labelled G in Figure 3.5. A first profile was taken along a linear feature which was noted to result in an image of a series of separate higher resistance areas. The line was localised using a resistance meter and a profile was run along it (11a in Appendix 2). This showed a continuous high resistivity (50-70 ohm.m) feature extending down to about 1.3m, with no discontinuity, though that might be because of the measuring/analysis method. A profile line crossing it at 22m is shown in Figure 3.23 (11b in Figure 3.10) and it shows the feature's resistivity is lower, at less than 30ohm.m, so may indicate the discontinuity.

Profile 11b N-S crossing the linear feature at 22m



Profile 12 W-E crossing two linear features

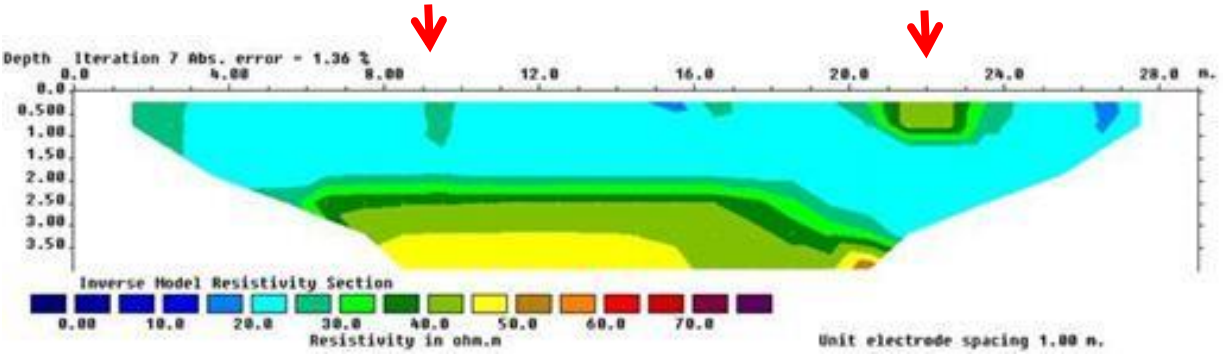


Figure 3.23 Profile 11b and 12 across the linear features in the northern area

A further profile number 12 was run across two linear features just to the north of profile 11 in Figure 3.10 and shown in Figure 3.23. The positions of the two features are arrowed. These linear features do not go deeper than 1-1.5m. These results all appear to show different characteristics, so presumably origins of the features, which are at present unknown.

3.5 Profiles at the western end of the Park area

The western end of the Park showed a complex of indications in the geophysics surveys. These led to patterns of results within the group of resistivity profiles that we took here, the group

labelled 13 in Figure 3.10. However without any additional information, they are difficult to interpret, or take any further in investigation, and the majority of these profiles are shown in Appendix 2.

Profile 13a is shown here and is made up of two profiles overlapping at point 20 and running south to north from the Ornamental Pond edge to the pathway.

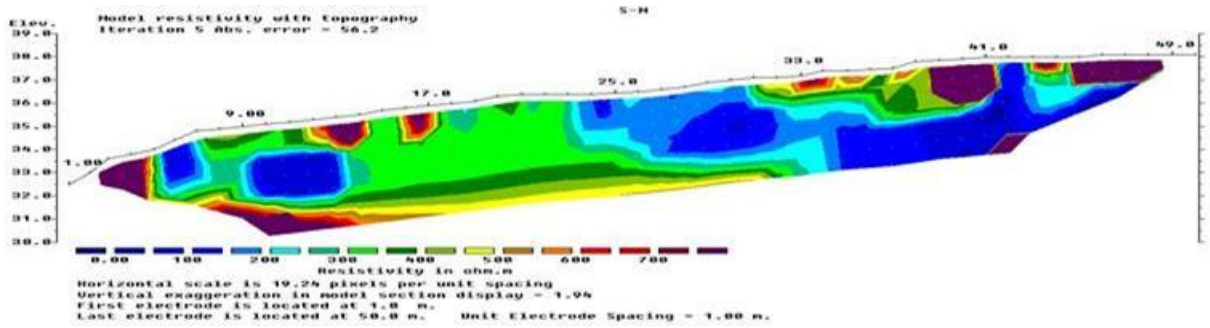


Figure 3.24 Profile 13a across this section in the Park S-N starting at grid 0 above the Pond

Although the results at the southern end of this profile are partial and therefore possibly anomalous, the high readings seen here may reveal banking above the Pond. The linear higher resistance feature observed just to the right of H in Figure 3.5 crosses this profile at an angle so may possibly correspond to the higher resistivity results in the left hand end of the profile. The northern part of this section also indicates higher resistance volumes towards the top of the slope. As mentioned above no interpretable pattern has been observable in the results here and in the other profiles in group 13 south of the path in Appendix 2.

Profile 13c was made west-east across a short north south parch mark that had been observed on the Botanical Garden side of the path just to the north of Profile 13a. The profile is shown in Appendix 2 and shows a clear high resistance volume corresponding to this observation. However this parch mark did not continue beyond the pathway and no relation could be seen to our other results.

3.3.6 Profile 14 across a round feature noted in the LiDAR image

One of the notable features in the LiDAR imaging is the round slightly raised areas to the north of the area, one of which was described in Figure 3.3 to be a flat mound 15m wide about 0.5m high. The position of the resistivity profile across this is shown by the red line in in Figure 3.25 which also shows the profile.

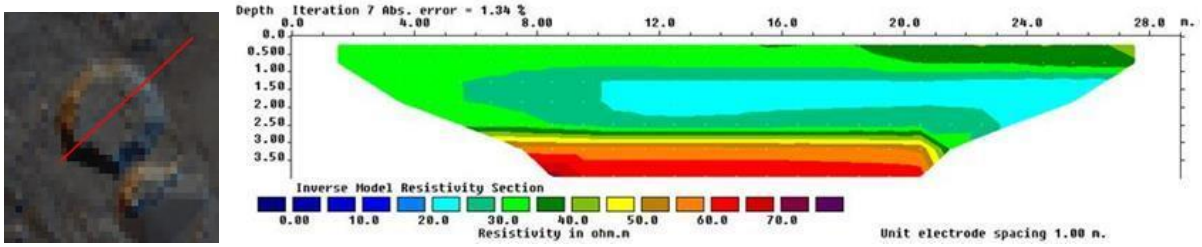


Figure 3.25 Profile 14 across the mound SW-NE

The mound area is above a lower resistivity volume. There is no indication there of a volume below the ground indicating a crater associated with bomb damage or anything structural that could indicate any rounded built feature. This mound will be discussed further in 4.4.4.

3.4.7 The areas showing possible rectangular building areas in the Park

As mentioned before there are only two areas in the Park surveys that clearly indicate possible rectilinear areas that might show building remains. Two of these were investigated further with resistivity profiling as follows.

3.4.7.1 Profiles 15a and b across the possible rectilinear building area indicated in the central section

The profiles are shown in Figure 3.10 and were set up to cross the area of the rectangular feature shown as “n” in magnetometry in Figure 3.8. They are arranged SW-NE as shown in Figure 3.26. The profiles are also detailed in Appendix 2.

There is higher resistivity in the area inside the dark magnetometry anomalies which possibly may indicate a 15m x 10m structure with deposits around it as any ditching is not shown in the profile cross sections. The profile to the south east gives a slight indication of a track, again rather than a ditch, leading from the rectangular area to the south east.

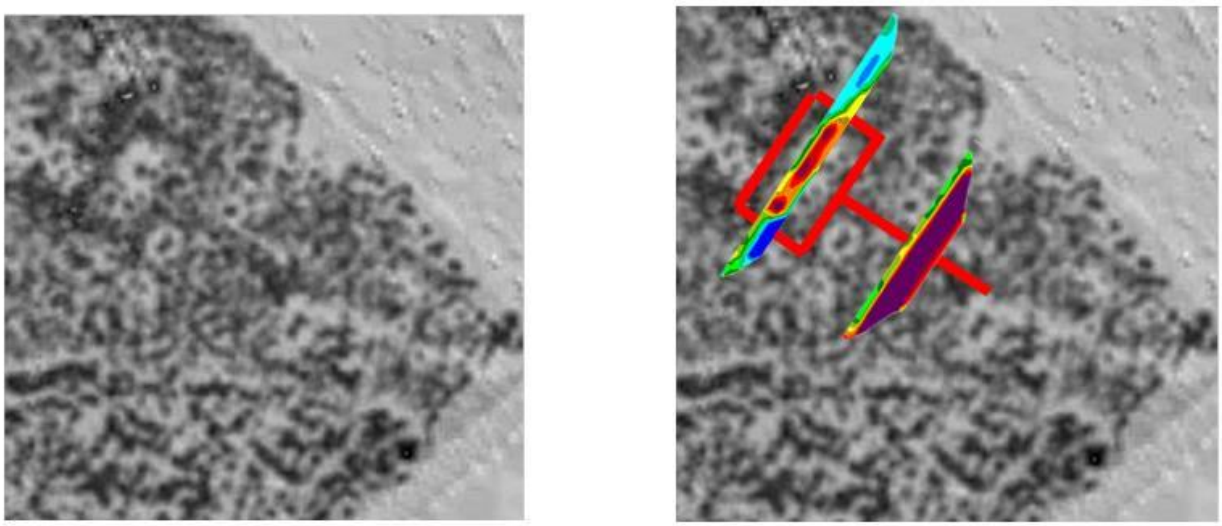


Figure 3.26 Profile 15a set up to cross the possible building and Profile 15b to cross the possible track

3.4.7.2 Profiles across possible rectangular building area shown in the resistance surveys towards the east

A second rectangular area was indicated in the resistance profiling survey to the east, and was investigated by profiles 16a and b. The resistance pattern shown in Figure 3.10 appears to indicate a rectangular building with a walled space, about 10m by 12m, with a possible wall extending from it each direction from the NW to the SE. This is shown in Figure 3.27 with the two profiles across it.

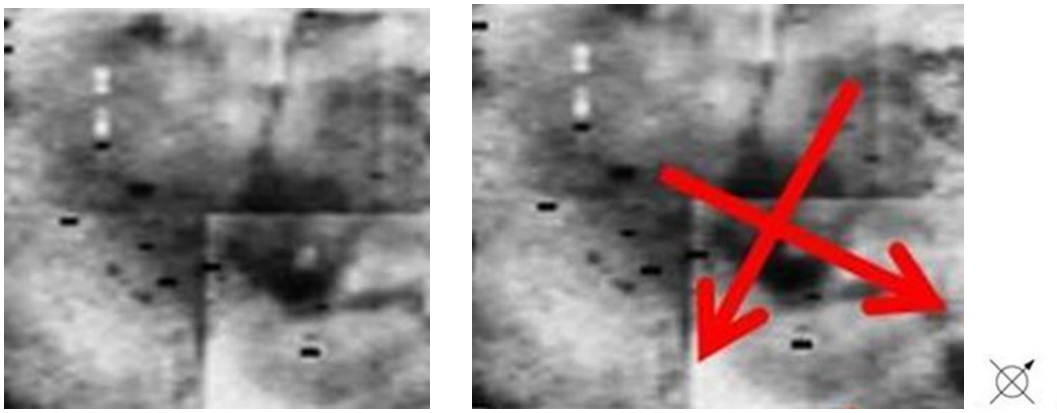


Figure 3.27 Resistance survey area showing possible indications of a building with the resistivity profiles across it. The NE- SW one is pictured first (profile 16a) then the other (16b, at right angles).

The differential resistivity patterns within the top 1.5m might indicate possible building remains across this area in both these profiles, but these are not very clear. There also appears to be a 5m wide high resistance volume below these, which is only crossed by the second profile. The results will be discussed further in Section 4.5.

3.5 Other observations made during the investigations in the Park

3.5.1 Large stones positioned in the Park

There are several large stones positioned across the Park, many in the Botanical Gardens. Many of these have been repositioned from other Bath areas, donated to the Park by benefactors, including from estates at Batheaston and Claverton.[9] There are also the stones that have been relocated to the top of the Park following the excavations to make the skateboard park.[11] During the survey, photographs were taken of many of these, but we have not pursued any further investigation.

3.5.2 Parch marks in the Park

Parch marks had been noted in the grass over a few days in the very hot and dry period in summer 2018 and photographed by members of the team. However, there was no opportunity for precise location of them in relation to our surveys. Where relevant they have been mentioned in the background to obtaining these results. Additional useful information might be gained from locating them in any future observations and measurements.

4 Discussion

The results indicate that this area was a focus of activity across time, and probably not just for agriculture, but how is not known. Although at first sight our results could be summarised as showing a mass of seemingly unconnected linear and other features, we hope that that in time they will help any interpretation of the past use of the area.

4.1 The roadways and pathways across the park

Examination of the earliest known map of the area[3] shows there were pathways across the fields predating the layout of the Park which were used as a basis for the current paths crossing between the carriageways.

4.1.1 The current pathways across the Park

The pathways are well used by the public, but survey was carried out in quieter time along some of them, and they were surveyed by both resistance and magnetometry. The pathways were not clearly distinguished in the magnetometry survey (Figure 3.7) but they did show as high resistance in the resistance survey to a width of about 5m in Figure 3.1, much wider than their current size.

4.1.2 Possible continuation of an old roadway out towards the west

The Rev Scarth refers to Roman pottery finds being found in graves along a Roman road running across the Park.[24] Little earth movement was carried out in making the Park except for the areas used for landscaping the roads,[4] but it is clear that substantial amounts of Roman, including burial, finds must have been uncovered, as indicated by the significant selection of pieces that are now in Alnwick Castle.[22,23] No collection appears to have been kept locally.

The Roman road to the west is usually presumed to be along Julian Road and the Weston Road (*Via Julia*) but there may have been different roads in this direction during the Roman period as the area developed.

Possible evidence for another roadway in this direction has been indicated from our results in the profiling results next to the path which makes a continuation of Cow Lane. A profile (Profile 1 in Figure 3.11) indicated a possible way with a 5m wide cross section, without ditches. If it was a Roman road of any significance it could have been at one period the road which heads towards Weston village, and up the hill towards North Stoke and to the west. It would be at approximately right angles to the Foss Way (direction) road excavated by Time Team,[17] and if continued, it would have crossed it south of the Royal Crescent.

The extension of the line of this possible road north-westward crosses the bottom southwestern corner of High (Great) Common. It is hoped that some confirmation of its presence will be gained by the short geophysics survey in the southern part of High (Great) Common, proposed as an Addendum to this report.

4.1.3 Apparent non-continuation of the holloway running down High Common and approaching this part of the Park

An old north south holloway in the landscape is known up the slope to the north in the lower part of High (Great) Common (see (a) in Figure 4.1), ignoring all the golfing greens and teeing off areas of its current recreational use. This extends south from the Roman/Iron Age settlement.[20]

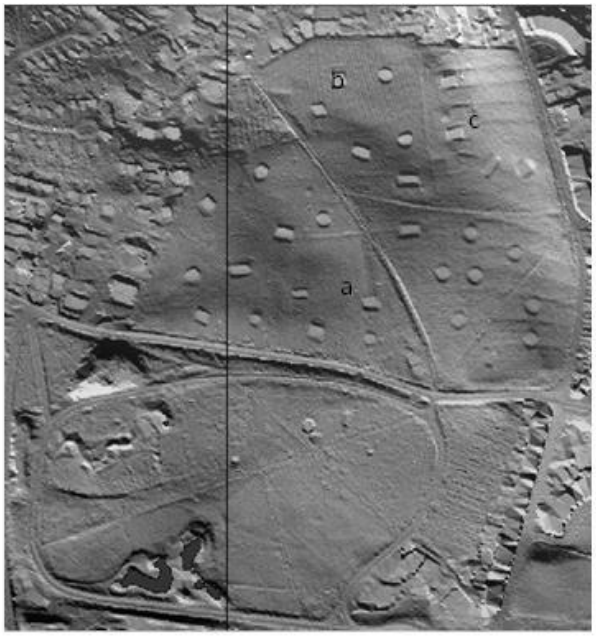


Figure 4.1 LiDAR image extended to include the Great (High) Common to the north of the surveyed area indicating (a) the NS holloway (b) linear features in the ground, (c) field boundaries ST7365&7465_DTM_1m_HS_A20_H15_8bit

It is described[31] that if the holloway line was projected its line would continue down the slope to the Roman/Iron Age settlement on the Lower Common. We found no evidence for such a southward continuance into the surveyed part of the Park in our results. A short geophysics investigation of this area and the slope around might give further information on how its course runs, and whether it does extend beyond High Common. This work is planned to be included as part of the Addendum programme of geophysics work in High (Great) Common.

4.2 Large areas for previous activities in the Park

Within the results of the surveys we obtained several indications from the geophysics that may show the possible demarcation of large areas of the land in its past. Many of these areas appear unrelated to the known Common field arrangement from which the Park developed.

4.2.1 The Common Fields

The only clear exception to this is the border between Lower Common and Middle (Ring) Common where a significant ditch feature can be observed in the landscape as well as seen in the surveys and in Figure 3.13 and Figure 3.20. It is filled along part of its length.

The Common Fields were used for agriculture over the years. Our results appear to show indications of historic ploughing over the northern and eastern sections with an approximately 3m wide parallel pattern as seen under low magnification in Figure 3.7. This could possibly correspond to ridge and furrow ploughing in medieval times. Further up the hill to the north in High (Great) Common linear patterns can be observed as shown (b) in the LiDAR image in Figure 4.1, further apart (4-6m) than those we observed to the south.

In addition in the LiDAR image of High (Great) Common there can be made out a probable defined field system of about 110 x 21 m plots (c) running east-west and curved to the slope between a pathway and the roadway. Such a pattern was not observed in the area we have surveyed to the south.

4.2.2 Large possibly rectangular area of different usage across the southern sections

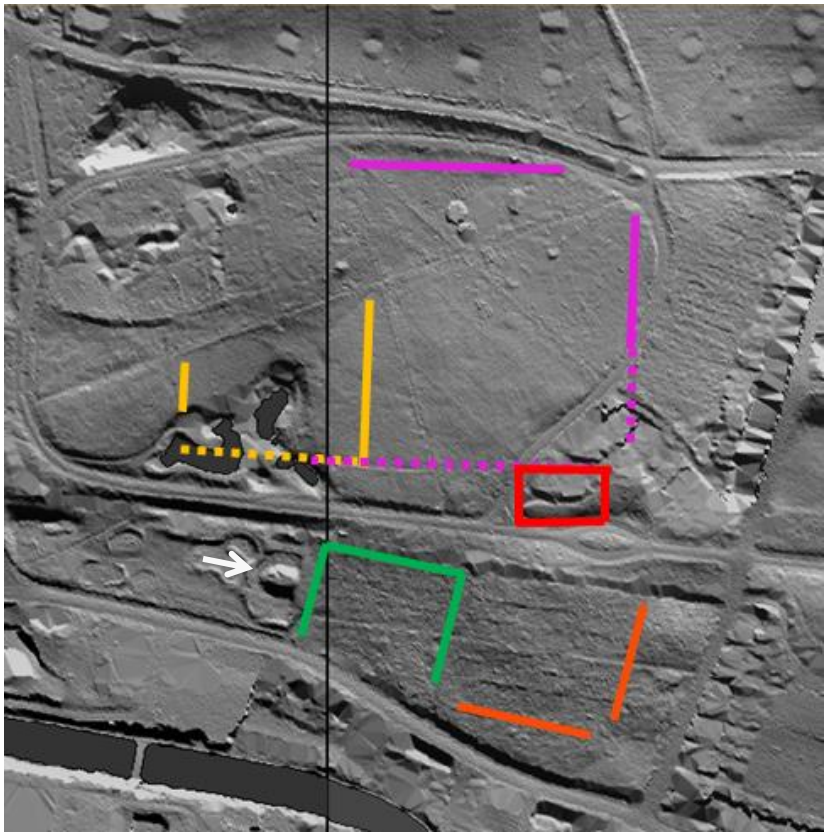
One possible area showing apparently differential past use was indicated in the magnetometry survey as shown in Figure 3.7. The results indicate considerably less activity or deposits in what looks like a rectilinear area 160m wide. This area is not coincidental with the area described as "Made ground: embankment, quarry spoil and tips" shown in Figure 1.2. It includes the area of the Ornamental Pond, created in 1878. No description of the creation of this pond has yet been found in our researches.

Within this area of different usage there is a series of parallel linear magnetometry anomalies running down the easternmost side, which may or may not be related to being present in this area. These are described in Figure 3.8 (d) but were not detected in the resistance surveying. They may be related to the long parallel parch marks observed in the ground here in the hot summer of 2018. They could be due to disturbance due to the creation of drainage, but no information relating to this is known.[11] The pattern of resistivity in the profiles across this area (Figure 3.12) indicates that these results may be due to rows of pits or narrow trenches extending down to 1.5 m under the ground. These could be the remains of plantings or palisading or relate to some structural feature including drainage. There is no indication that they are part of the apparently rectangular area. A simple test pit excavation may well solve the question of their origin, and we hope that this can be planned.

4.2.3 Other rectangular areas

There are also other large possibly rectangular areas that may be historically significant and some are shown in Figure 4.2. One is that indicated by the border between Lower and Middle Common and the lines at right angles along the side of the Park area (purple). Other areas as shown in the Figure, are derived from both experimental results and from geographic observations. Further indications not indicated in this Figure may be present in our results, such as in the high resistance features under the allotment area north of the rounded terraced areas as observed in Figure 3.19.

Arrowed in Figure 4.2 is a hillock. This is where a high slide has been built in the area of the children's' playground. It should be noted that consultation[11] and comments from past users of the Park reveal that this mound was created relatively recently.



Yellow: see Figure 3.7
Purple: linear features in Figures 3.1&5
Green: the allotment plot area shape
Orange: from Lower Common excavations[19]
Red: Mow Barton[28]

↑N

Figure 4.2 Rectangular indications drawn on LiDAR image ST7365&7465_DTM_1m_HS_A20_H15_8bit, colouring and source as in the table

4.3 The water courses across the park

The central source of the water for the Park is referred to as the "Spring" area. Another spring and the stream leading towards this point are marked in the Thorpe map at the bottom of High (Great) Common, leading to this area. Mud (Mad) Brook is the other main water course towards the area, running down the slope from the springs up to the northeast at St Winifred's well. The course of this brook has been managed in the past with the angular diversion to avoid the Royal Crescent area,[2] a diversion which, from the field boundaries, predates the Crescent's creation The results of some of our observations relating to the water courses through the Park from these are described below.

4.3.1 Spring water supply and drain leading to the Ornamental Pond area

From the top of the area, the water is piped towards the Pond area. We observed results due to this pipework clearly in the magnetometry survey in Figure 3.5, the ditch patterns seen in the ground, as well as possible palaeo- and other channels observed in the LiDAR and survey information. Along with these there is the watercourse running from the tank in the "Spring" area culverted to the lower area of the pond, as shown in "Lost Streams of Bath",[2] which we did not observe results in our results. However it was noted that the end of the pipe next to the bottom eastern section of the pond gushes heavily in strong rain.

4.3.2 Possible culvert running across the lawn towards the Ornamental Pond from the "Spring" area

We do appear to have obtained results that may relate to the remains of the known stone culvert that runs down across the Park towards the Ornamental Pond from the "Spring" area. The culvert has been observed to be large, rectangular, and big enough for a person to crouch inside.[11] It is not observed in our ground geophysics surveys but we may have crossed it in profiling near the Ornamental Pond (Figure 3.16) and again near the "Spring" area (Figure 3.17&18). The shape that may be the culvert is rectangular (approx.. 3.5m x 1.5m). However these results are not clearly continuous or consistent so more investigation needs to be done to confirm its course as well as any complexity as indicated by the concatenated profile near the north end shown in Figure 3.17b.

If this were a single feature following a line from the "Spring" to the top of the Ornamental Lake (through the shallower rectangular area in Figure 3.15) it would have a gradient of about 1 in 16 (6%). Such a route would also appear to be approximately on the Foss Way alignment. If ever the actual culvert were to be exposed it would be of great interest to observe for information towards its original dating.

4.3.3 A further possible large round 3.5m wide culvert running parallel to the Marlborough Buildings in the Ring Common allotments

When we were carrying out our investigation of any continuance of possible structural remains into the Ring Common allotments using resistivity profiles, we observed a large possible culvert running part way down the allotment slope (Profile 7a in Figure 3.19). This is a more rounded shape and 3.5m wide and 3.5m high, positioned about 15m to the west of the course of the current culvert feature carrying Mad (Mud) Brook towards the river which follows the course of the brook in the map of 1786.[30] The results in a parallel profile 5m to the south (7b in Appendix 2) indicate that if it is a culvert there could be a fork in it there, which could lead towards the area below the Royal Crescent. Again if this feature was ever exposed it would be of interest to study further.

4.4 Other demarcations for use for different purposes

There are a large number of long linear features across the Park distinguishable in the LIDAR images and in our resistance and magnetometry results. Many of these are not coincident with or in similar orientations to each other, and while they may well have been manmade and must have been important to the people who made them, few give clues as to their original purpose.

4.4.1 The Ring

We do have some information about the area's past use for horse riding. The Ring was described by John Wood as an important part of the local social facilities to allow carriages and riding around an area in Georgian times. He describes the Ring in the Park, paralleled to the one in Hyde Park.[8] The alternative name for Middle Common as Ring Common could come from this, and the allotments on the eastern side were known as Ring Common Stables allotments.[16] John Wood describes the Ring as 600 yards in diameter (about 175m). Examination of our survey

images revealed no clear delineation of any ring type structures, but a superimposition of the 1742 Thorpe map[31] into the LiDAR image in Figure 4.3 shows slight indications that reinforce the positioning of the Ring in this relatively level area at the top north east corner. Part of this structure appears to have been used later in the 1830 Park roadways. The highly resistant layer to the western side of the resistance survey in Figure 3.5 and in the results in resistivity profiling (see Figure 3.19) could coincide with reinforcement of the ground in this area.

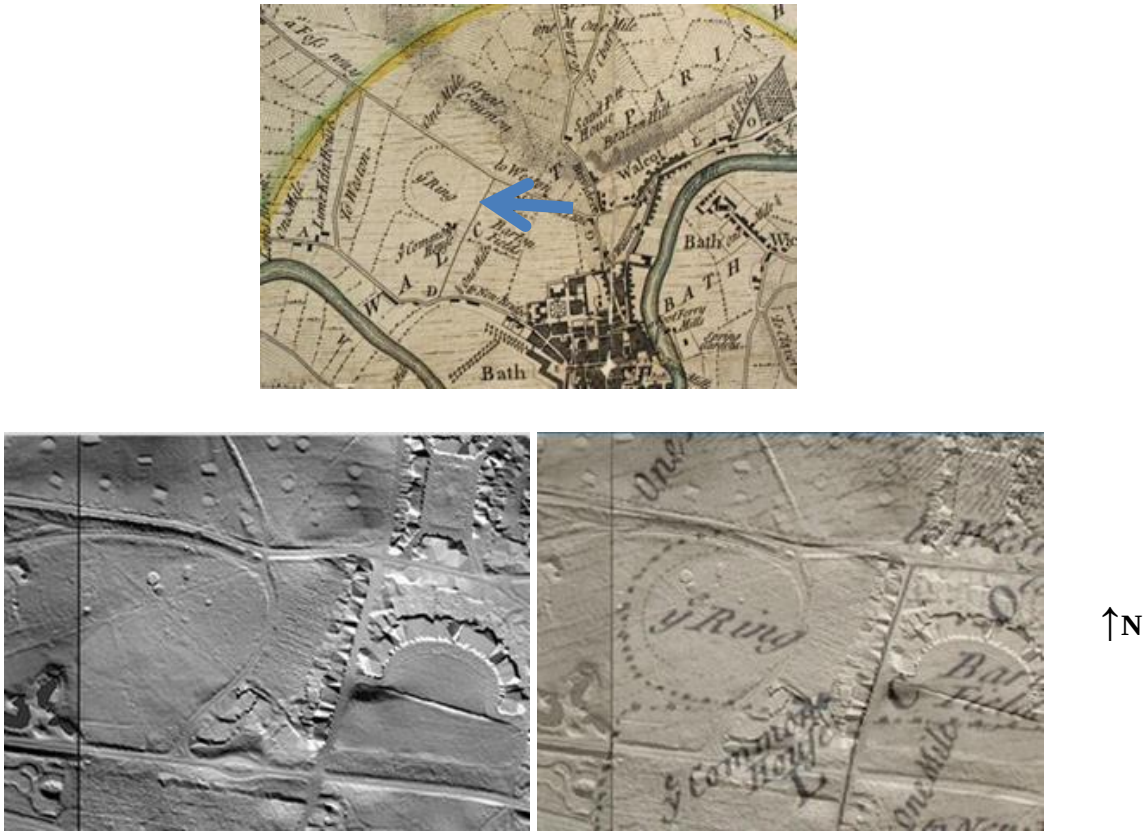


Figure 4.3 The Thorpe 1742 Five mile from Bath map, © Bath and North East Somerset Council, www.bathintime.co.uk,and the LiDAR image ST7365&7465_DTM_1m_HS_A20 _H15_8bit with the two superimposed using QGIS georeferencing including the Ring (arrowed), to indicate its position

4.4.2 Possible significance of the two circular indications to the east of this area

The two partially circular terraced areas in the council glasshouse area were noted as “xi” in Figure 3.1. These also coincide with the area from which gravel was obtained.[33] They became part of the built developments in the area, the higher banked area[11] housing glasshouses. The lower one is now the Council department car park, and was previously used for roller skating in the Park, in the facility opened in 1876.[34] We have no information to what extent these lower developments created or used any already present terraced structure.

Only this lower terrace appears to be in the area described as Mow Barton (see Figure 4.2), later Mr Harrison’s garden, so both curves are unlikely to be due to landscaping from such times. In relation to riding we know there are circular areas used in training horses and riders and these could have been such areas. If so their possible depth may indicate their age. A possibility is that they were Roman gyrus as in 'The Lunt' fort at Baginton near Coventry.[35] However if they were originally circular, their diameter would be around 70m which is twice the diameter of the gyrus at the Lunt, and there is no indication of a similar ditch arrangement here.

Another possible suggestion is that they might have been the rounded ends of Roman Circus arena sites. There are linear features observed in our results under the grass that could relate to this possibility, as noted in Figure 3.21, but there is no obvious information providing the evidence for the rest of the necessary structural arrangements, including in the complexities observed at the western end of the Park and noted in Figure 3.16. At over 450m the Park is long enough for a Circus as at Colchester.[36] We do not know if this is the same as the area dug for gravel that contained finds including the remains of a man wearing a short sword belt as described by Scarth,[24] who could possibly be military or a gladiator, but it appears to be approximately the site where Haverfield put a "?" for a Grave marker.[22]

4.4.3 Linear features running toward the north

Part of the interpretation complexities involve a group of linear features in the eastern side of the Park, this time running up the hill (F in Figure 3.5 as described in 3.4.5.2). Again these could possibly have been used for recreational use, and a possible interpretation of such features could include horse racing, but that would mean crossing (or predating) the Weston Road and extending into the lower part of High (Great) Common. Again no such use or crossing is indicated but the possibility of such an extension is planned to be further investigated with a little focussed surveying as part of the geophysics proposed as an Addendum to this work.

4.4.4 Possible origin of one of the observed rounded features as scenery in the 1909 Bath Pageant

One exception to our difficulties in interpretation of the features indicated by our geophysics in the Park may be that of a rounded area observed towards the north. A possible explanation could be that it is the remains of a bomb crater, but this circular area as analysed by profiling in Section 3.3.6 shows no clear crater pattern, and consideration of the bomb pattern over Bath[37] indicates that although there are several circular crater remain areas in the ground on High (Great) Common, the records report no bomb damage in this immediate area.

However in the description by Andrew Swift and Kirsten Elliott of the Pageant of Bath in 1909,[14] there is one area used as scenery which is yet to be confirmed, the position of the healing pond where King Bladud and his (actual) pigs bathed. Were this rounded area the remains of that piece of scenery for the Pageant it would have been appropriately sited opposite the Standing Enclosure, as shown in Figure 4.3 and arrowed, away from the Stand and at the edge of the performance area. This suggestion may be likely.[38]

Figure 4.4a Enlargement of plan of pageant shown in Figure 1.5 showing position of circular feature

Figure 4.4b Photograph of King Bladud and the pigs in the Bath Historical Pageant, 1909[39]
© Bath and North East Somerset Council , www.bathintime.co.uk

Examination of the photograph of the pool shows a path behind the rocks, so presumably it is looking towards the south east. If this was the site, they may have had more than one attempt at siting it as seen in the LiDAR image (Figure 3.1 "xiii").

4.5 Possible habitation sites

This area of land is south facing with its good spring water supply and a not too abrupt slope. As noted it is between the known Bronze Age, Iron Age and Roman developments in the areas around. However, as we have also noted, no large scale habitation sites have been revealed in the geophysics surveys in this area. Although intended as an area never to be built on[5] within it there had been some building including the old Common House,[3] replaced by the gothic creation of Park Farm, (converted to the two houses to the north of the Victoria monument) and Park Cottage, built in what became the Botanical Gardens, and removed before the garden's creation.[5]

Following is a description of the few results from our surveys that may be related to other building in the area.

4.5.1 Possible round house

Apart from some relatively unconvincing rounded indications in the western and southern surveys, there is just the one obvious indication of a possible round house as differentiated in the magnetometry survey shown in Figure 3.9. It would appear to be 10m diameter. It can be noted that this is in the same area as a group of dark anomalies which might possibly be pits. The results from this whole area were examined with detail in case there might be further indications that might be related to the standing stone arrangement[16] which is just over the hedge to its east in the allotment area described in Section 1.2.3. However, from our results, there seemed to be no other geophysical indications to take the investigations further.

4.5.2 Possible rectangular buildings

There is the indication of a single rectangular, possibly 10m wide, building shown in the resistance survey as I in Figure 3.5. The resistivity profiling in Figure 3.27 shows these remains to be near the surface. It appears to have a communication wall which may indicate some continuous development.

In the magnetometry results there is the other possible large rectangular structure discussed in Figure 3.25. It is 0.5m under the ground with dimensions 15m x 10m. Profiling indicated results relating to a building with possibly the deposits of material around it detected in the magnetometry survey.

There is information that indicates there would have been accommodation in the Commons which housed the oxen to pull the wagon to and from the Common on the City which carried night soil or stone from the quarry for road building, and to house the Town Plough.[7] So either of these may be a candidate for the Ox House, or for some other building of farm or other history.

4.76 Unknown possibilities

Perhaps the only use of this area was agriculture, and the results we have seen are the short term temporary uses of the many different leisure activities since it became used for recreation. However, whether any of these results explain why this area was not exploited at a higher level, unlike the areas around, remains to us a question.

5 Conclusion

The preceding collection of indications and anomalies from our results reveal that this was an area that appears to have been used by the local population for other purposes as well as agriculture over the times in its history, but the causes of many of the indications are at present unidentifiable.

There appear to be several examples of areas which may have been delineated for differential use. Whether any of these extended across the current Weston road is planned to be investigated with some resistivity profiling in High (Great) Common (see the description of the geophysics investigation proposed in the Addendum to this report). This Addendum proposal also includes the investigation of the possible extension of the suggested old road in the direction towards Abona.

Our results from this work may also give further information on the complexity of the water relations of the Park in relation to both the “Spring” area supplied with the water from the north west. The significance of the connection of this to the spring shown in the Thorpe map in Figure 1.3 in the south of High (Great) Common, together with the route of the holloway, is also planned to be further investigated as part of the Addendum work.

The possibility of making a request to undertake a short excavation in the area of the array of those intriguing north south linear features to the east of the Ornamental Lake, to clarify their nature as part of any interpretation of at this particular area, is hoped to be discussed.

The interpretation of the results in this Report certainly needs more information about the management and the history of the wider area but we maintain the hope that the work described here will be seen to be more informative in the future.

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30. Plan of the Commons belonging to the Freemen of Bath, Trimnell 1791 Bath In Time: Images of Bath 27242
31. Roman building HER ref 61979
32. Thorpe, T. *Map of 5 miles around Bath.* Bath In Time: Images of Bath 19177
33. Harcourt Masters C. *Map of Bath* 1796 Bath Records Office
34. Kirsten Elliott personal communication, advertisements Bath Chronicle 1877
35. Roman fort at the Lunt. Historic England Scheduled monument 1017245
36. Crummy, P. 2005. *The circus at Colchester* J. Roman. Arch. 18, 267
37. 1942 OS map Somerset sheet XIV modified to show bomb damage Bath Records Office 1946
38. Kirsten Elliott personal communication
39. *Official postcard published by Lewis Brothers commemorating the Bath Historical Pageant*. 1909. Bath In Time: Images of Bath 15762

Appendix 1 Survey arrangement

The four project sections were undertaken as shown as in Figure A1:

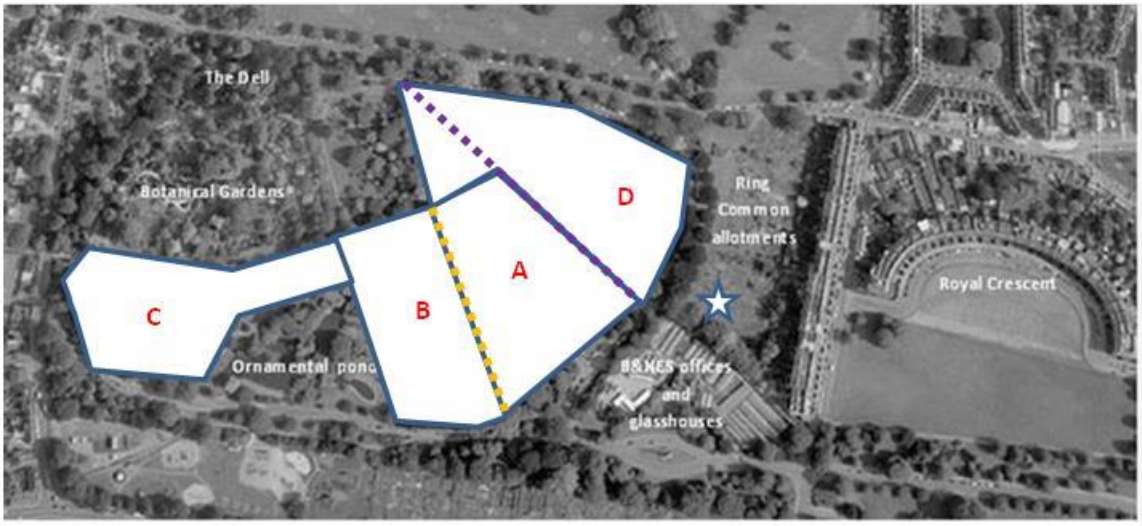


Figure A1 Map of Park showing the four surveyed areas ©Google Earth with grateful acknowledgement

Section A November - December 2016 and March 2017

The line taken for the grids for the first project was the east side of the pathway (orange) starting 10m from the bin placement and from the gatepost (now removed), with the 60m point being between the two mature cherry trees each side of the path: 3.4m from the western and 1.5m from the eastern tree. Further profiling took place in the Ring Common allotment area, at 5m and 10m south of the allotment plots as asterisked.

Section B February 2018

This project continued the same alignment as project A.

Section C September 2018

This project continued the same layout as project A extended from there to a group of trees at the western end of the Park near the inner roadway, with a 0 position 9.78m from the chestnut tree, 11.91m from the lime tree and 11.55m from the maple tree. A point 100m along the line was situated 26.25m from the oak tree and 13.07 from the pine tree.

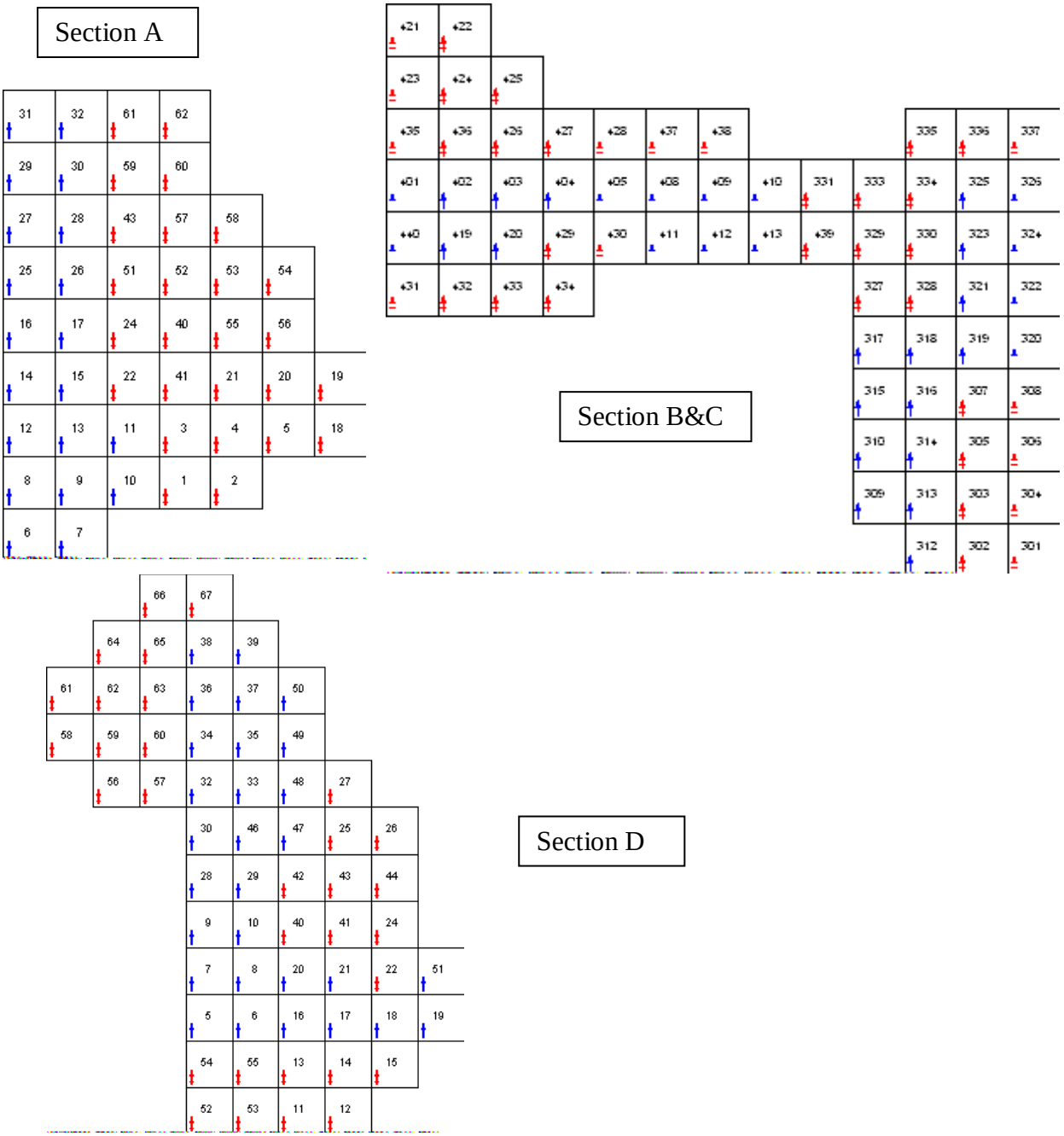
Section D February 2019

In this section the grid alignment was taken along the path extending from the Cow Lane direction, as shown in purple. The zero point was at the sign post in this corner, lined up with the post at just over 140m, next to the path crossroads.

The surveys were carried out as follows.

Twin probe resistance survey

All resistance measurements were taken at 2 per metre along lines 1 m apart, giving 800 readings per full 20 m square. The Geoscan RM15 downloaded data in zig-zag fashion as walked. The TR/CIA meter downloaded data sorted to parallel lines. In figure A5, the crossed red arrows are RM15 squares, those with blue arrows were those using the TR device. The grid sequences as worked are shown in Figure A2&3.



FigureA2 Twin probe resistance survey grid arrangements sections A, B/C and D

The TR/CIA resistance meter was also used for resistivity depth profiling.

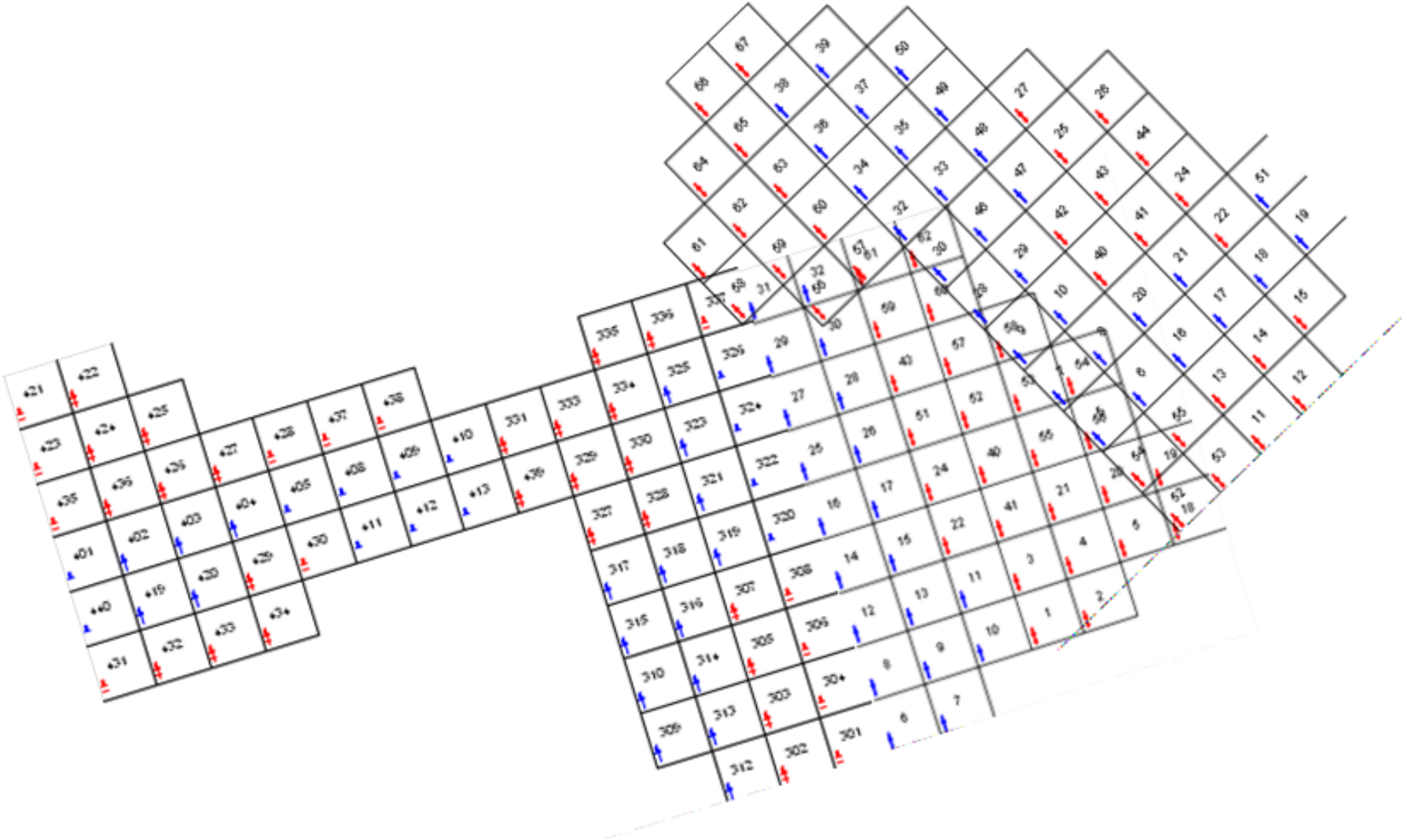
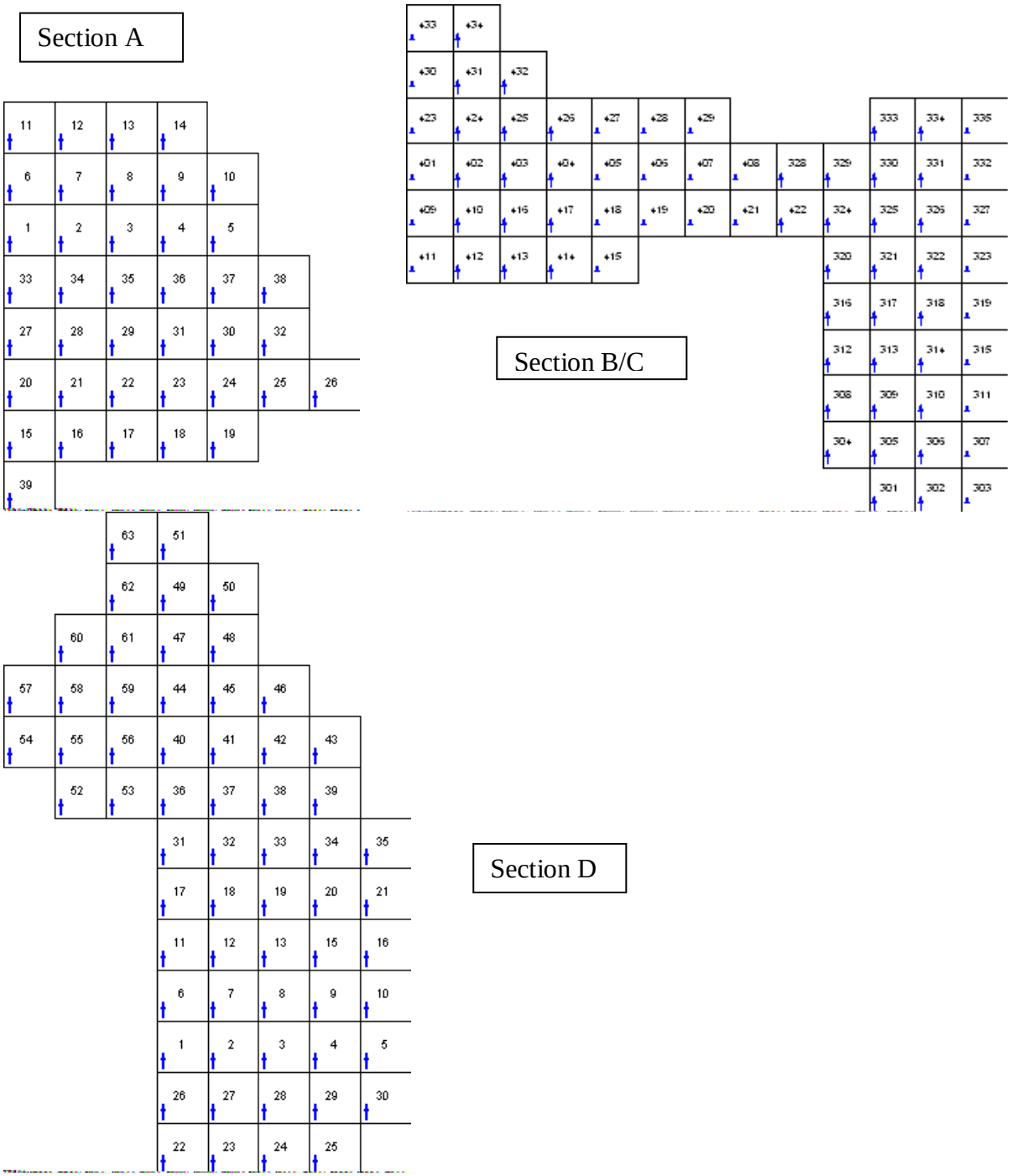


Figure A3 The resistance survey 20m grid layout over the Park ↑N

Magnetometer survey

The Bartington 601-2 dual fluxgate gradiometer was set to take 4 readings per metre along lines 1 m apart, giving 1600 readings per full 20 m square. The data were all sorted to parallel lines during download. The grid sequences as worked are shown in Figure A4&5.



FigureA4 Magnetometry survey grid arrangements sections A, B/C and D

As is usual BACAS practice, the first line was started 1 m from the grid edge and finished on the next grid edge. Also, lines were started 1 mark up from base and finished on the top line, so that there was no hiatus or doubling of points.

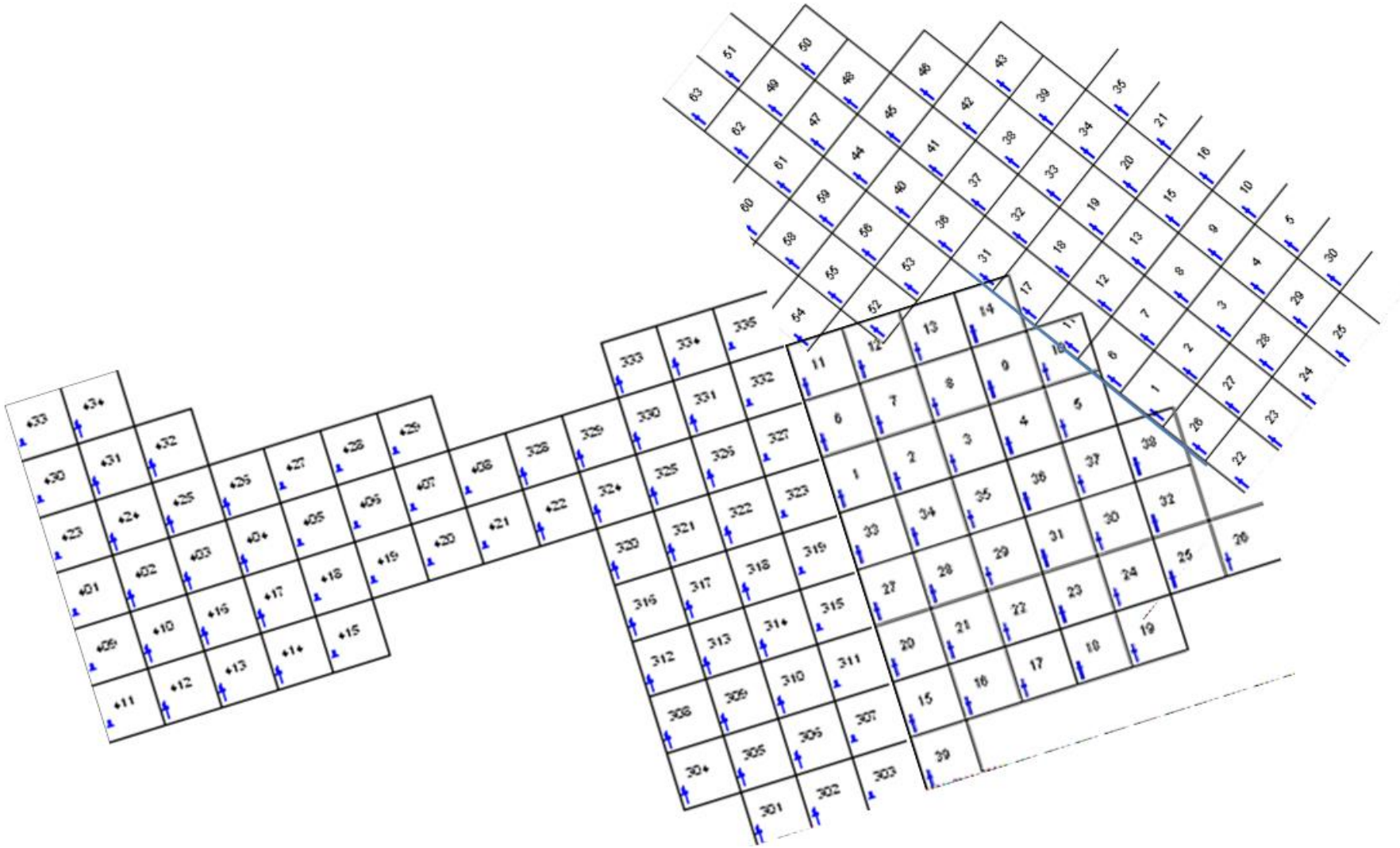


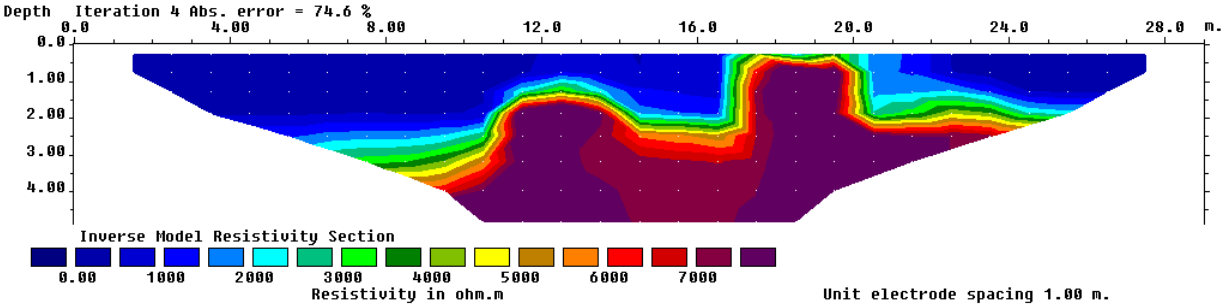
Figure A5 The magnetometry 20m grid layout over the Park ↑N

Table A1 Coordinates of resistivity profiles. Point 0, 0 is at the bottom left hand corner of grids in Figure A3 with metres given up and across the grid for position.

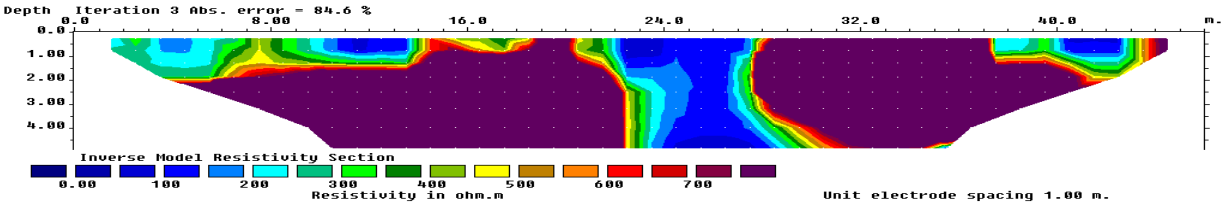
Profile No in Figure	Project Part	Project profile number	Profile position coordinates	Profile length m
1	D	Q1	Grid 62 10,-4 (to west of grid boundary), through grid 49 10,0 into grid 49	31
2	C (area B)	Q23	Grid 317 10,16 , to grid 318 10,0 into grid 319	29
3	C (area B)	Q21 & 22	Grid 304 0,0 to 309 15,0 into grid 310	29 17 m overlap
4a	A	Q201	Grid 7 13,0 through grid 12 0,0 into lawn edge	31
4b	A	Q202	Grid 8 13,0 through grid 13 0,0 into lawn edge	31
5a	B	Q5	Grid 331 20,0 through grid 327 20,0	31
5b	C (area B)	Q14	On diagonal between grids 329 20, 0 and 325 0,20 with 15m point at 325 20,0	29
6a-c	D	Q2-4	Grid 46 10,0 through grids 42, 38, 33 0,0	29 19 m overlap
6d	D	Q9	Grid 40 10,10 through grid 36 20,10	29
6e	D	Q10	Grid 56 10,0 through grid 53 20,0	29
7a	B allotments	Q1-3	From hedge edge running W-E across 5m south of the southern allotment plot edge	31 17 m overlap
7b	B allotments	Q4-7	From hedge, 5 m to the south of profile 7a	31 17 m overlap
8	B	Q1-4	Grid 305 10,0 through 309 20,20, and 319 10,0	31 17 m overlap
9a	A	Q 203, 214 & 215	Grid 20 5,0 through grid 28 5,0 and 35 5,0	31 21 m overlap
9b	A	Q5-7	Grid 15 5,0 through grid 21 5,0 and 29 5,0	31 21 m overlap
9c	A	Q1-4	Grid 29 5,0 through grid 16 5,0 and 22 5,0 and 29 5,0	31 21 m overlap
9d	A	Q8-9	Grid 16 0,15 through grid 17 5,0 and 23 5,0	31 21 m overlap
10a	D	Q5-6	Grid 4 20,0 to grid 29 20,10 and through 0,20	29 15 m overlap
10b	D	Q7-8	Grid 27 20,10 through 24 20,0	29 15 m overlap
10c	D	Q15	On diagonal of grids 27 20,20 to 22 0,0 set with 29 m at 6 m from S end	29
11a	D	Q11	Along line found by resi: grid 62 20,5 from 47 20,5 through 44 14, 20	29
11b	D	Q12	Grid 44 0,0 through45 10,0	29
12	D	Q13	Grid 62 2, 18 through 46 10,0	29
13a	C	Q29 & 28	Grid 415 10,0 through 418 0,0 and 405 0,0	29 20 m overlap
13b	C	Q31 & 30	Grid 403 15,0 through 494 5,0 and 417 20,5	29 20 m overlap
13c	C	Q27	Grid 420 0,0 through 407 0,0	29
13d	C	Q26	Grid428 5,0 through 429 5,0	29
13e	C	Q25	From hedge 422 10,10 through 328 (B) 0,10	29
14	D	Q14	Grid 40 0,5 through 41 0,0	29
15	A	Q212 & 213	Grid 35 10,10 through 4 0,0 and 10 0,0	31 17 m overlap
16	A	Q211	On diagonal of grids 31 0,0 and 37 0,0 with 31 m point 37 17,17	31
17a	D	Q16	Grid 3 10, 0 through 2 20.0	29
17b	D	Q17	Crosses 17a at right angles grid 7 20,10 towards 2 ,0,0	29

APPENDIX 2 Additional resistivity profile results
See Figure 3.10 for Profile numbers

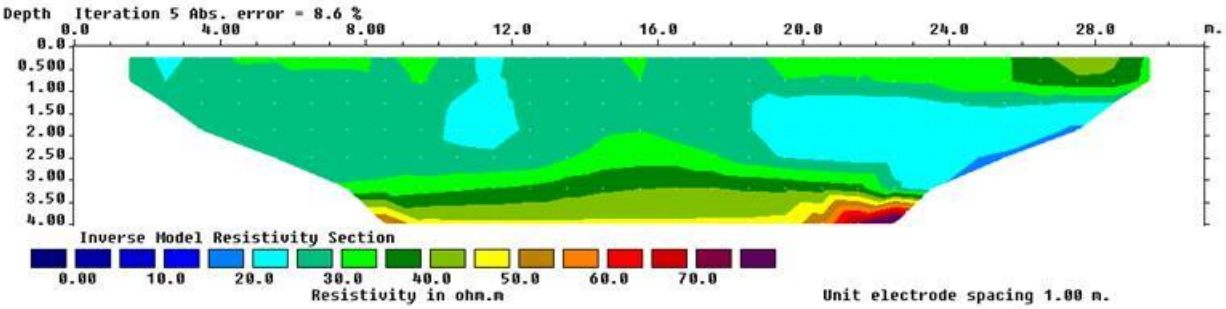
Profile 2 linear scale



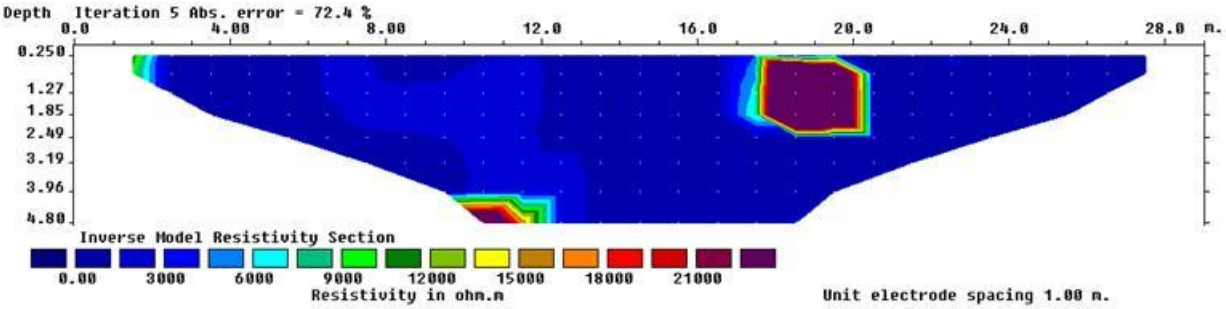
Profile 3 linear scale



Profile 4b to the north east of the Ornamental Pond



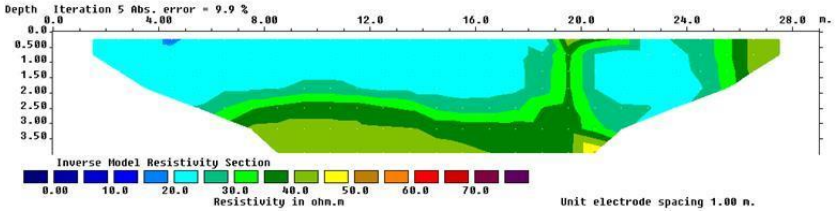
Profile 5b logarithmic scale



Profile 6a-c To investigate the possible culvert from the "Spring" area

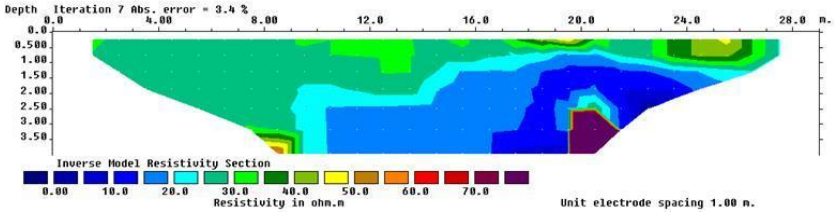
Three profiles (6a,b &c) were run across the grass west to east to the south west of the position of the spring. They overlapped at 19m to give the concatenation in Figure 3.17.

6a

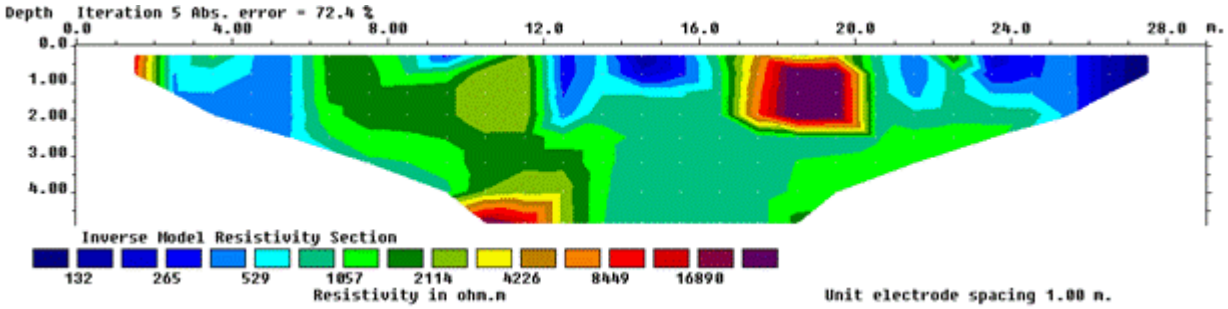


6b in report

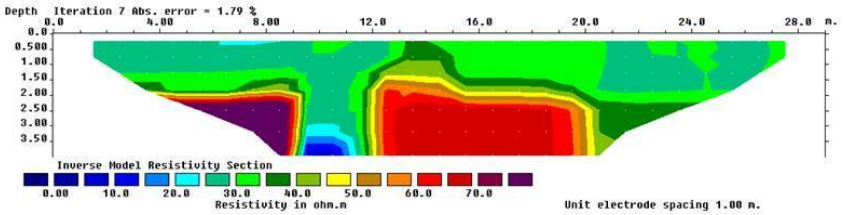
6c



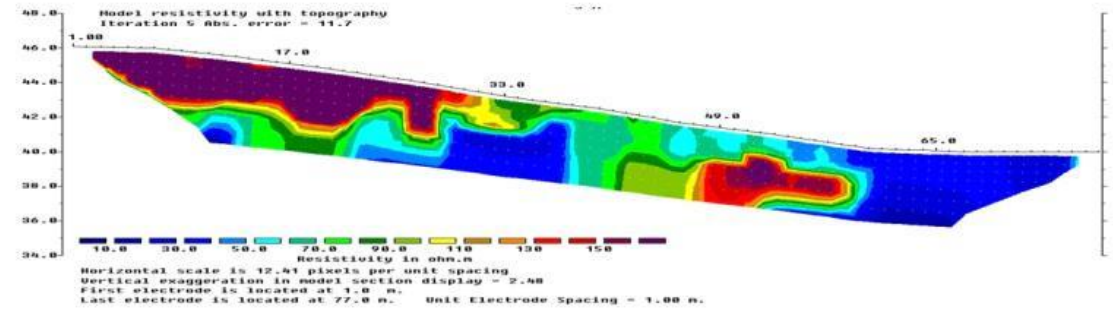
6b logarithmic scale



Profile 6e to the south of the pathway possibly missing the culvert

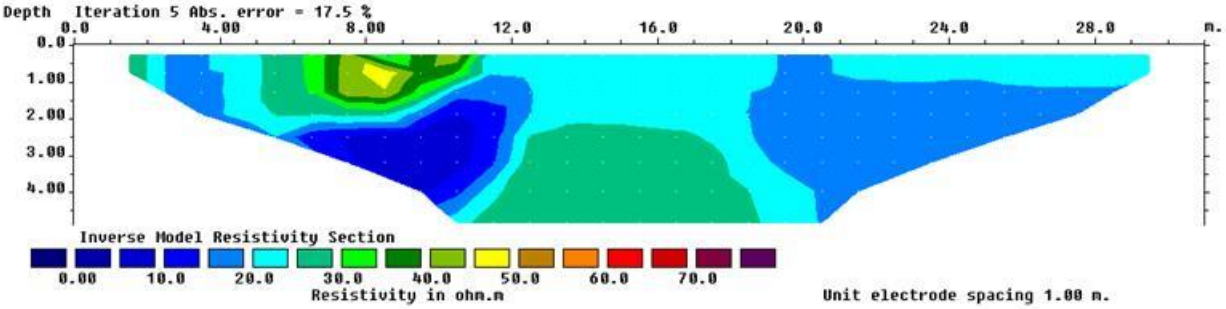


Profile 7b southern culvert in Ring Common allotments concatenated with topography

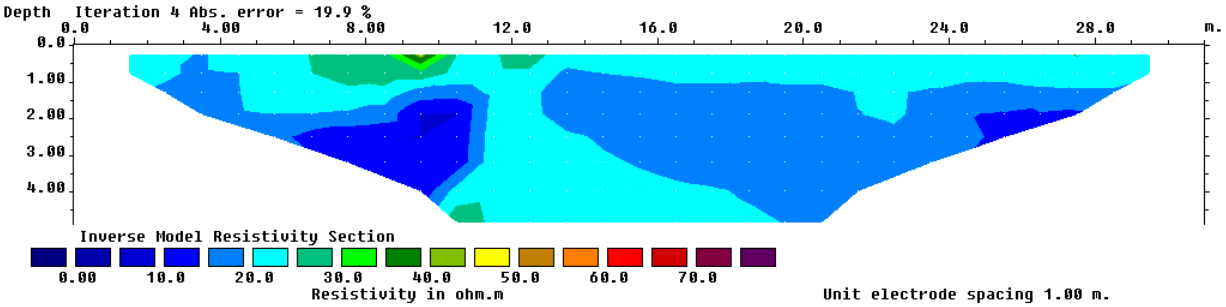


Profiles 8a-d the grids SN to the east of the Ornamental Pond concatenated in 8a-d

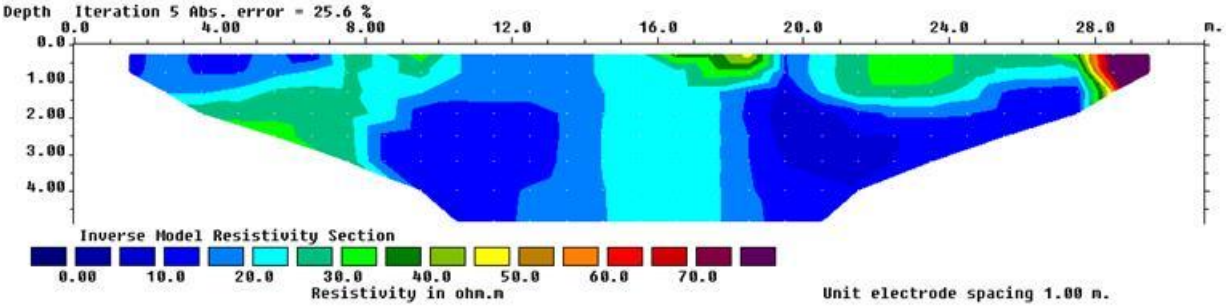
8a



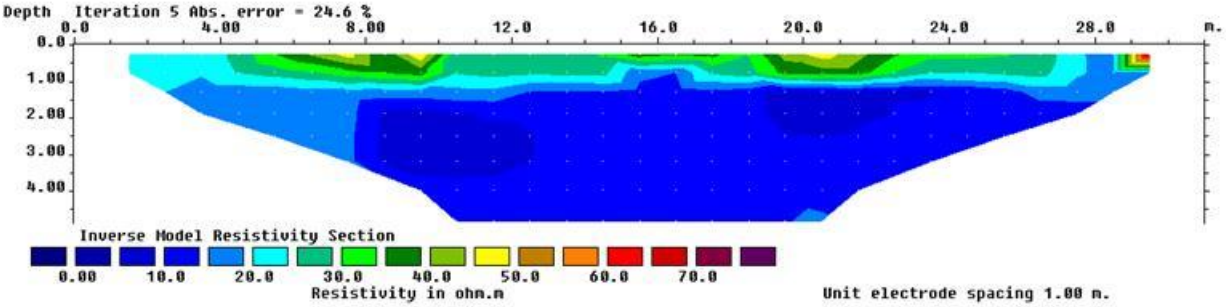
8b



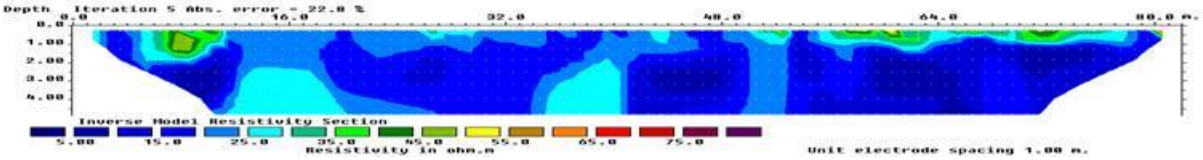
8c



8d



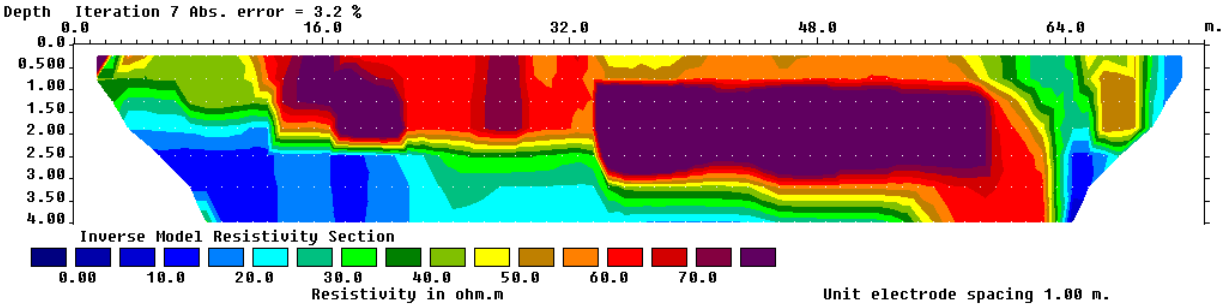
8a-d



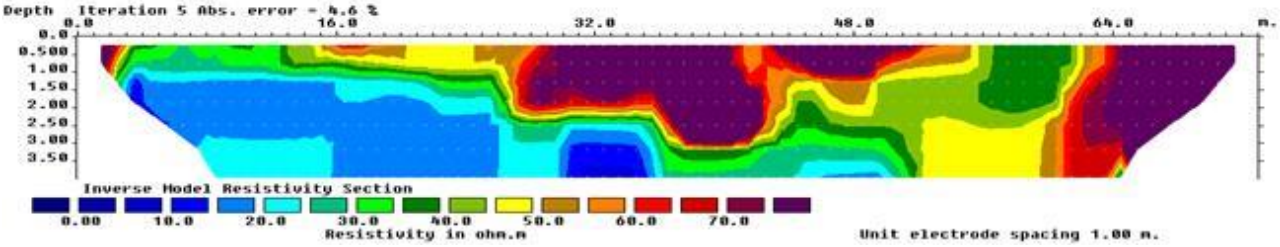
Profiles 9

Profile 9a showing the westernmost line of profiles
This line of profiles was carried out later. During the measurement of the first profile, the profiling equipment developed a fault in a wire connection. (This was successfully mended before other profiling.) Five zero values were inserted in the results which were not permitted by the processing programme. On analysis the other results appeared normal, so averages from each side were taken for these missing readings and the results could be processed and used.

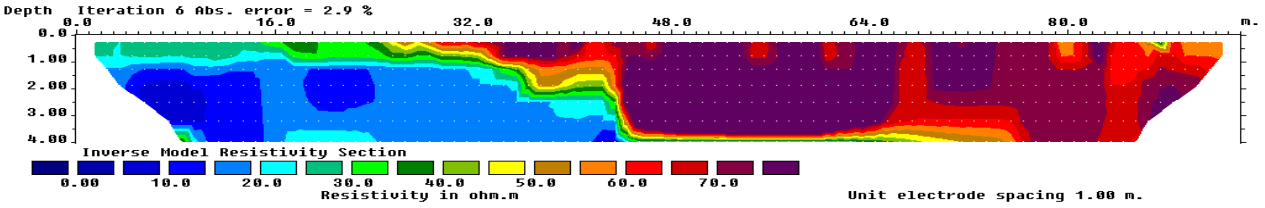
Profile 9a three profiles concatenated



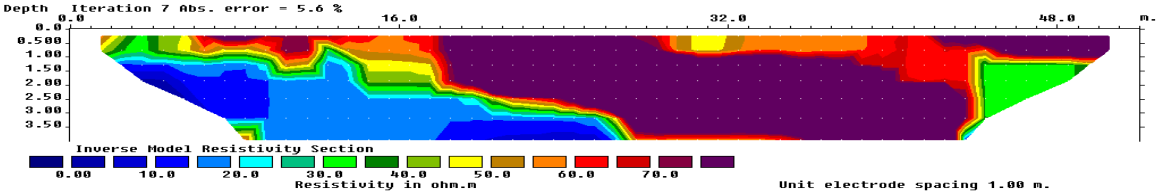
Profile 9b three profiles concatenated.



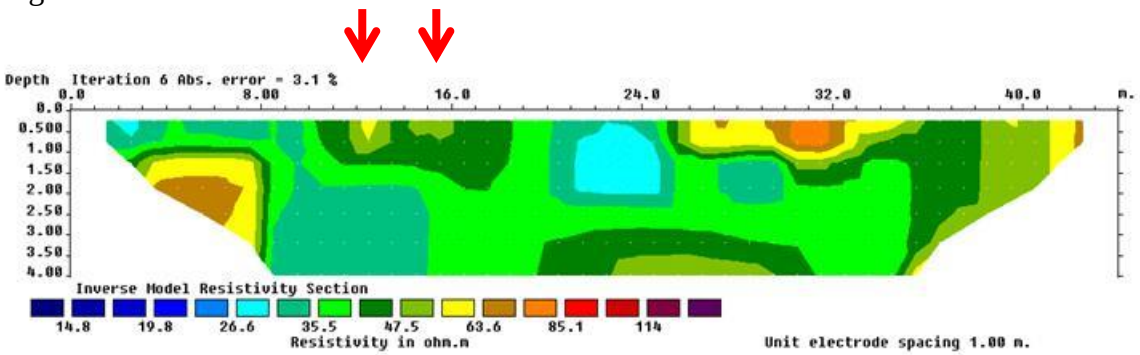
Profile 9c four profiles concatenated



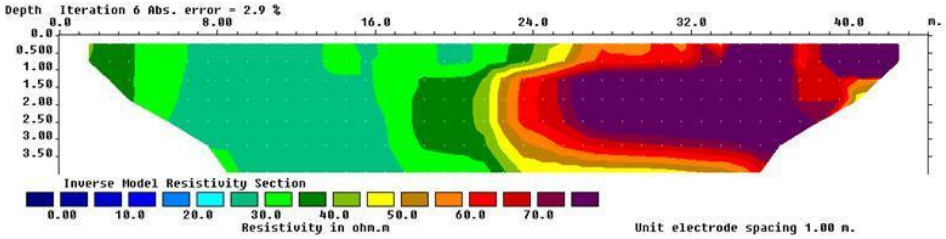
Profile 9d two profiles concatenated



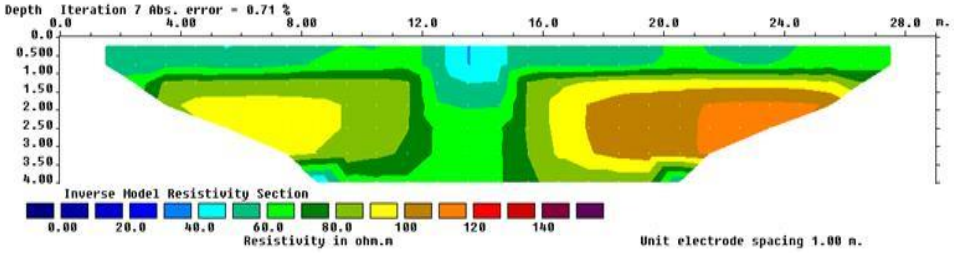
Profile 10a' Resistivity profile WE crossing the strong linear features running NS down the eastern part of the Park. This grid shows the westernmost grid in the concatenation with logarithmic scale.



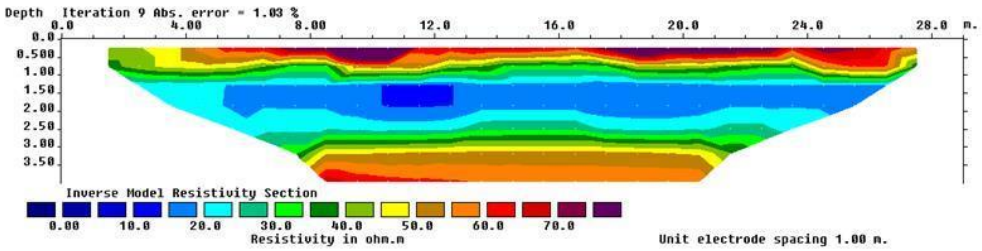
Profile 10b the two southern WE profiles concatenated



Profile 10c

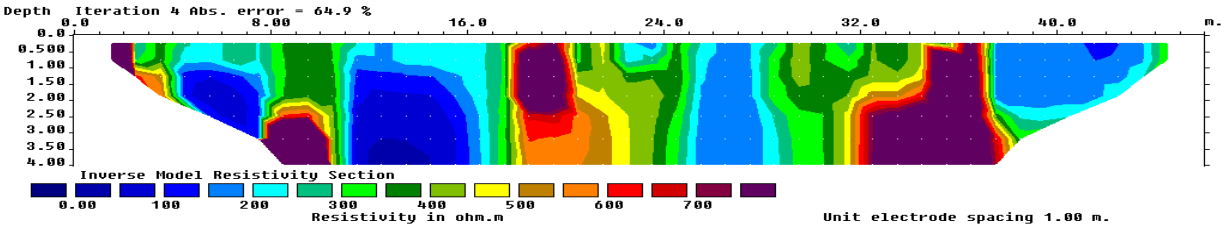


Profile 11a The resistivity profile following the strong discontinuous linear feature running WE along the line

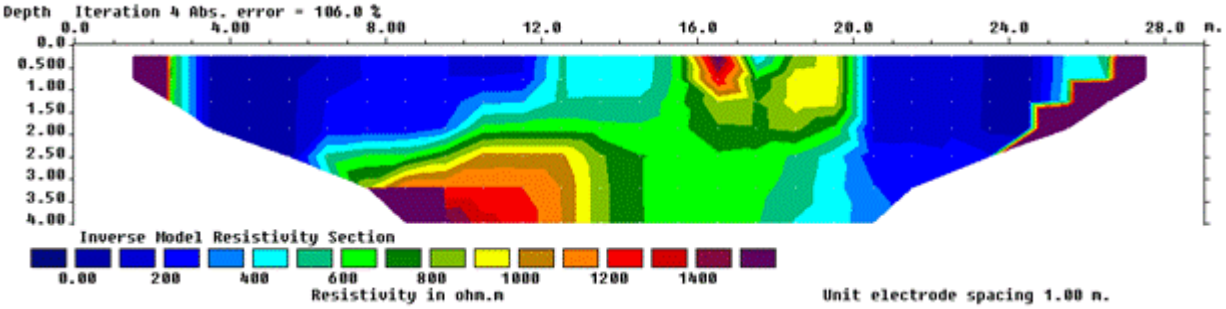


Resistivity profiles across the surveyed area in the western area

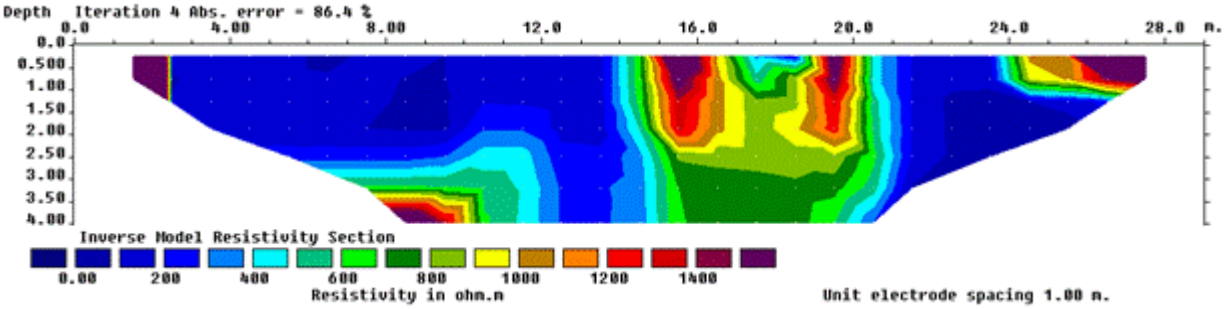
Profile 13b Two profiles taken across this section in the Park WE at 45° starting from 5m at grid 10m and overlapping from 20m



Profile13c SN

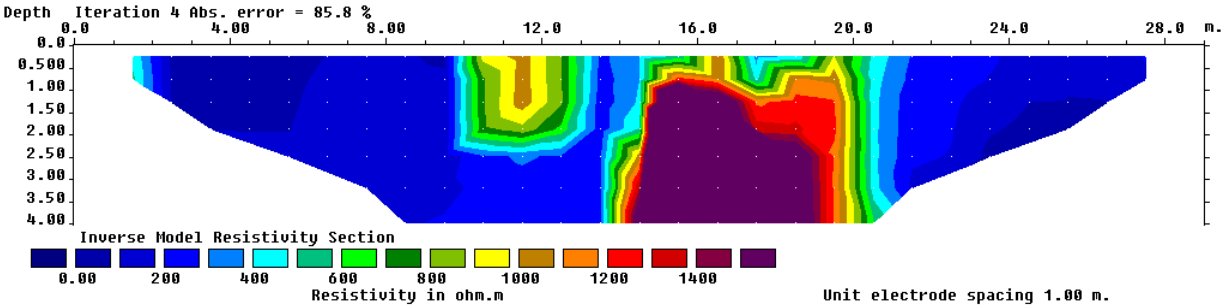


Profile 13d Resistivity profile across the NS parch mark extending from the Botanic Garden fence ending at the path

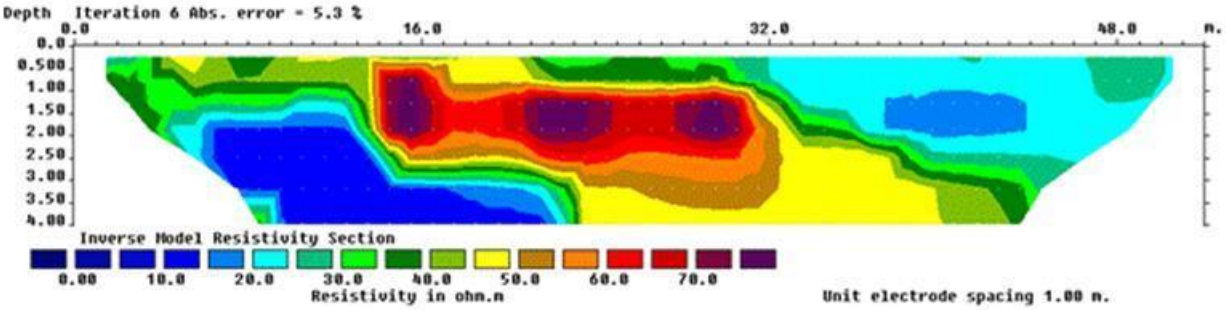
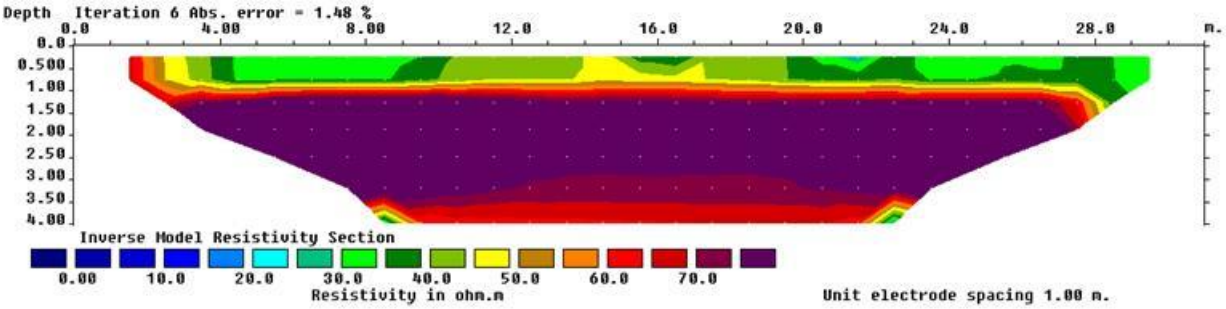


Profile 13e Resistivity profile over the parch marks north of the Pond area

A profile was run SN from the hedge across these to see if any corresponding resistivity results could be seen and none were.



Profile15, two concatenated grids across the rectangular feature on the grid diagonal WE



Profile 16 across the linear feature, on the grid diagonal starting at 17m along possible showing track like feature