

UAV Survey Assessment



Bristol City Museum Accession Number: BRSMG 2014.91 South Gloucestershire Council Planning Application Ref: PT/12/1930/O Ref: 106802.01 November 2015





UAV Survey Assessment

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November 2015
Bristol City Museum Accession Number: BRSMG 2014.91
South Gloucestershire Council Planning Application Ref: PT/12/1930/O

106802.01



Quality Assurance

Project Code	106802	Accession Code	BRSMG 2014.91	Client Ref.	
Planning Application Ref.		Ordnance Survey (OS) national grid reference (NGR)	357588 179920		

Version	Status*	Prepared by	Checked and Approved By	Approver's Signature	Date
v01	E	RM	ADC	A.S. Croslett	20/11/2015
File:	X:\PROJ	ECTS\106802_Rep	oorts\106802_U <i>P</i>	VSurvey.docx	
File:					

^{*} I = Internal Draft; E = External Draft; F = Final

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UAV Survey Assessment

Contents

	nowledgements	
1	INTRODUCTION	1
1.1	Project background	
1.2	The Site	
1.3	Archaeological Background	
2	METHODOLOGY	2
3	RESULTS	3
3.1	Introduction	3
3.2	Field 7	3
3.3	Field 8	3
3.4	Field 9	4
3.5	Field 10	4
3.6	Field A	4
4	CONCLUSIONS	4
5	REFERENCES	5
5.1	Bibliography	5
6	APPENDICES	6
6.1	Appendix 1: Gazetteer of transcribed features	6



UAV Survey Assessment

List of Illustrations

Figures

Figure 1: Site location and archaeological sites

Figure 2: Digital Surface Model

Figure 3: Principal Components Analysis (PCA) on multiple hillshades

Figure 4: Full colour aerial imagery
Figure 5: Near-infrared aerial imagery
Figure 6: Transcribed features
Figure 7: Interpretive hachure plan

Plates

Cover: Field A, looking north-east Plate 1: Field 8, looking south-east



UAV Survey Assessment

Summary

Wessex Archaeology were commissioned by Persimmon Homes Severn Valley to carry out an assessment of unmanned aerial vehicle (UAV)-derived survey data on land at Fishpool Hill, Filton, South Gloucestershire. The assessment was undertaken in support of an outline planning application (ref. PT12/1930/O) for a mixed-use residential development in fields immediately south of Filton Airfield.



UAV Survey Assessment

Acknowledgements

Wessex Archaeology would like to thank Persimmon Homes Severn Valley, who commissioned and funded the assessment, Callen Lenz, who undertook the UAV survey and Paul Driscoll of South Gloucestershire Council for his advice.



UAV Survey Assessment

1 INTRODUCTION

1.1 Project background

- 1.1.1 Following consultation with Persimmon Homes Severn Valley and Paul Driscoll, South Gloucestershire County Archaeological advisor, Wessex Archaeology (WA) were commissioned to carry out an assessment of unmanned aerial vehicle (UAV)-derived survey data of earthworks on land at Fishpool Hill, Filton, South Gloucestershire. Previous survey methods, including Lidar, had not provided sufficient detail for a meaningful interpretation of the earthworks. The survey area, hereafter referred to as 'the Site', is centred on NGR 357588 179920.
- 1.1.2 The assessment was undertaken in support of an outline planning application (ref. PT12/1930/O) for a mixed-use residential development in fields immediately south of Filton Airfield, currently the subject of a continuing programme of archaeological assessment works. Its purpose was to provide an accurate survey and assessment of the earthworks which have long been assumed to be associated with the former medieval settlement known as Charlton.
- 1.1.3 An archaeological evaluation was undertaken in the fields north of Wyck Beck Road and west of Fishpool Hill by WA in November and December 2014 (WA 2014). This followed earlier geophysical surveys (WA 2008 & 2011) and two desk based assessments (DBAs) (WA 2007 & 2012).

1.2 The Site

1.2.1 The Site comprises 20 hectares of agricultural land to the west of Fishpool Hill and covers four fields of pasture, investigated during the 2014 evaluation. For continuity, this assessment utilises the ascribed evaluation descriptions, namely Fields 7, 8, 9 and 10, plus an additional field adjacent to Elm Farm to the north-east, described here as Field A (**Figure 1**).

1.3 Archaeological Background

- 1.3.1 A series of ditched enclosures identified during the geophysical surveys were partially exposed during the 2014 evaluation and contained predominantly Romano-British finds, including ceramics, animal bone, iron implements, ceramic building material and stone roof slates and the structural remains of a building.
- 1.3.2 Earthworks within Fields 8 and 10 were interpreted as a droveway through a series of surrounding earthwork enclosures. The droveway is considered to be of possible medieval date, and is likely to be associated with the former village of Charlton, the full extent of Charlton has never been confirmed. The last vestiges of the village were located to the north and north-east of Elm Farm and were destroyed by construction of the Brabazon runway at Filton Airport.



1.3.3 The South Gloucestershire Historic Environment Record (SGHER) records the presence of earthworks associated with Charlton within the Site (HER reference 2983). A plan of the earthworks takes the form of six crofts with building platforms. Partial excavation in 1986 provided a date for features of the 11th to 14th centuries, followed by a later 18th-century phase. These features are thought to represent periods of expansion and contraction of Charlton village, the core of which lay beyond Elm Farm to the north. The excavated features were associated with ridge and furrow earthworks, the presence of which was also recorded in an earlier DBA (WA 2012).

2 METHODOLOGY

- 2.1.1 The UAV survey was carried out by Callen Lenz and resulted in the production of orthorectified full colour RGB (**Figure 4**) and near-infrared (NIR) aerial imagery (**Figure 5**) and a photogrammetry-derived Digital Surface Model (DSM) of the Study Area (**Figure 2**). The orthorectified aerial imagery has a horizontal resolution of 5cm, while the DSM has a horizontal resolution of 10cm.
- 2.1.2 Alongside the earthworks themselves, the DSM includes surface features, most notably vegetation in the form of field boundaries, trees and buildings on Fishpool Hill. It does not, therefore, provide a means of seeing beneath vegetation in the same way that LiDAR survey data does.
- 2.1.3 ArcGIS 10.3 was used to display and analyse the survey datasets and to record features. The Spatial Analyst extension was used as this provides additional tools that allow features within the datasets to be enhanced, making interpretation easier. A series of hillshades of the DSM were created, with the position of the light source increasing at 45° intervals. The hillshaded images provided a means of emphasising slight changes in height in the DEM, highlighting the banks and ditches characteristic of archaeological features.
- 2.1.4 Principal Components Analysis (PCA) was then carried out on the resulting eight hillshades, creating a single dataset in which common values across the eight datasets retained, effectively creating a single hillshade dataset (**Figure 3**).
- 2.1.5 A slope map of the DSM was created and styled in a manner allowing changes in the height values between adjacent cells to be highlighted.
- 2.1.6 Archaeological features were mapped in accordance with guidance developed by the National Mapping Programme (Aerial Survey and Investigation, Swindon 2010; Bishop and Oakey 2010; and National Mapping Programme 2010). They were recorded in a geodatabase that uses standard NMP forms and corresponding symbology.
- 2.1.7 Each component of an archaeological feature was mapped and once complete was contained within a 'monument polygon', with each monument polygon representing the full extent of the recorded feature (Bishop and Oakey 2010). A monument polygon can contain one feature or several associated features (e.g. a ditch and associated bank.
- 2.1.8 Monument polygons were assigned consecutive chronological numbers, starting with WA1001. A complete list of monument polygons, alongside descriptions of the transcribed features within, can be found in Appendix 1. The NGR is calculated as the centroid of the monument polygon.
- 2.1.9 Where referred to in the text, the main archaeological periods are broadly defined by the following date ranges:



Prehistoric		Historic		
Palaeolithic	900,000 – 9500 BC	Romano- British	AD 43 - 410	
Early Post- glacial	9500 – 8500 BC	Saxon	AD 410 – 1066	
Mesolithic	8500 – 4000 BC	Medieval	AD 1066 – 1500	
Neolithic	4000 – 2400 BC	Post- medieval	AD 1500 – 1800	
Bronze Age	2400 – 700 BC	19th Century	AD 1800 – 1899	
Iron Age	700 BC – AD 43	Modern	1900 – present day	

3 RESULTS

3.1 Introduction

- 3.1.1 The interpretation resulted in the recording of 40 monument polygons, comprised of a total of 63 components. Features were observed across the Site, with a higher proportion recorded within the northern half, particularly in the area associated with the village earthworks in Field A.
- 3.1.2 Transcribed features included banks associated with the former village of Charlton, former field boundaries and areas of probable ridge and furrow, alongside a small number of more ephemeral features (**Figure 6**). Key earthwork features have also been transcribed onto a hachure plan (**Figure 7**).

3.2 Field 7

- 3.2.1 Former field boundaries are present in the form of 1033 and 1035. These features divide the northern half of the field into two. 1033 is present on the 1841 tithe map.
- 3.2.2 The southern half of the field is within an area of known Romano-British features, and although any further clear evidence of archaeological earthworks is lacking, two ephemeral rectilinear features visible in the NIR imagery (1039 and 1040; **Figure 3**) may both represent traces of Romano-British activity.

3.3 Field 8

- 3.3.1 Field 8 is dominated by what is likely to be ridge and furrow, four distinct parcels of which (1016, 1019, 1022 and 1027) are present in the data (**Figure 6**). These were highlighted in an earlier DBA (WA 2012) and may be associated with the earthwork features present in Field A to the east.
- 3.3.2 The ridge and furrow features are separated by former field boundaries. 1021 is present on the 1841 tithe map and historic OS mapping. While unrecorded on historic mapping, 1018 appears to perform a similar function. 1014 may also represent an earlier boundary. Additional boundaries to the south (1030 and, possibly, 1031), again present on the 1841 tithe map and historic OS mapping tithe map, represent further earlier division of land in the field.



- 3.3.3 An 80 m long gulley represents a probable droveway as recorded in the 2014 evaluation (WA 2014). It marks the northern boundary to a ridge and furrow parcel to the south (1027) and appears to link the ridge and furrow remains in Field 8 to the earthwork remains in Field A.
- 3.3.4 An ephemeral rectilinear feature (1020) is present within 1022.

3.4 Field 9

3.4.1 The sole transcribed feature within Field 9 is 1037, A 65 m long bank. The bank is slight compared to other historic field boundaries and may represent a more pronounced ridge related to agricultural activity. It corresponds with a trend in the 2011 geophysical survey (WA 2011).

3.5 Field 10

- 3.5.1 A small number of linear features are present in Field 10. Of these, 1006 is interpreted as a modern service in the 2011 geophysical survey (WA 2011), probably representing a pipe.
- 3.5.2 1005, a 120 m long, east-west running ditch, is unmarked on historic mapping but may represent an earlier field boundary. This is hinted at on the 1886 OS map, which suggests the remnants of an earlier boundary at this location.
- 3.5.3 The north-south running ditch and associated bank feature 1008 may represent a northward extension of 1014 in Field 8.

3.6 Field A

- 3.6.1 Field A contains a number of features not marked on historic mapping (**Figure 6**). All of the features (1002-3, 1007, 1009-10, 1012-13, 1016-17, 1023 and 1026) are likely to represent remains of earthworks associated with the former village of Charlton.
- 3.6.2 Feature 1009 is a right-angled ditch and bank in the north-east corner of the field. It enclosed 1007, a more ephemeral feature on the same alignment. Taken together, these features may represent the location of former buildings. To the south-west lies 1012, a series of banks on a similar alignment. Again, these earthworks may be indicative of the positions of former buildings.
- 3.6.3 The southernmost features in Field A, 1023 and 1026, represent further earthworks associated with the former village of Charlton, with 1023 providing a northern boundary (possibly a droveway) to the three parallel banks recorded as 1026; additionally, 1017 may represent a further bank similar to those in 1026. These banks help provide further evidence for the possible building platforms and crofts as listed in the SGHER.
- 3.6.4 Of the features in the north-west corner of Field A, 1010 and 1013 are similar enough in size and alignment to also be associated with the former village. Furthermore, 1002 may represent a northern extension of 1010.

4 CONCLUSIONS

4.1.1 The assessment has proved successful in mapping a number of features across the area, in particular those relating to the earthworks in Field A. When viewed in terms of the recorded presence of a southern extension to the former medieval village of Charlton the presence of these features demonstrates the archaeological potential of the field immediately south-west of Elm Farm.



- 4.1.2 Furthermore, these earthworks can be seen in association with four parcels of ridge and furrow in Field 8, themselves bounded by banks and ditches representing earlier field boundaries, some of which are field boundaries recorded on historic mapping, with other features following a similar alignment.
- 4.1.3 A gulley interpreted as a droveway appears to link the possible settlement features in Field A with the ridge and furrow in Field 8.
- 4.1.4 Although the UAV assessment was unable to provide further evidence of Romano-British activity in the southern fields, some ephemeral features are present.

5 REFERENCES

5.1 Bibliography

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6 APPENDICES

6.1 Appendix 1: Gazetteer of transcribed features

WA No.	Description	Period	Easting	Northing
	A 12 m long section of ditch with a depth of 25 cm in			
	the north-east corner of Field 10, possibly part of an			
1001	earlier field boundary unmarked on historic mapping.	Undated	357763	180024
	A 30 m long, north-south running section of bank			
	within Field 8, abutting a present-day field boundary.			
1002	The feature is unmarked on historic mapping.	Undated	357834	180007
	A slight, 55 m long north-south running bank			
	immediately to the east of WA1003. The feature is			
1003	unmarked on historic mapping.	Undated	357841	180001
	A slight, intermittent, 35 m long north-south running			
	bank in Field 10. The feature is broken by modern			
1004	tracks and is unmarked on historic mapping.	Undated	357753	179998
	A 120 m long, east-west running ditch in Field 10.			
	Although unmarked on historic mapping, the 1886 OS			
	map suggests the remnants of an earlier field	19th		
1005	boundary in this location.	century	357625	179992
	A 60 m long, SSW-NNE running ditch in Field 10. The			
	feature is interpreted as a modern service in the 2011			
1006	geophysical survey report (WA 2011).	Modern	357708	179990
	A faint, sub-circular feature enclosing approximately			
	100m ² is visible on aerial imagery in Field A. It is			
	incomplete in the south-west corner and is enclosed			
	by WA1009. It may be related to the former village of			
1007	Charlton.	Undated	357948	179986
	A ditch and associated bank in Field 10, running for 70			
	m in a north-south direction. It may represent a			
1008	northward extension of WA1014.	Undated	357684	179987
	A right-angled bank and ditch in Field A, visible in both			
	the DEM-derived datasets and the aerial imagery. It			
	measures 70 m in length and encloses WA1007. The			
	1886 OS map hints at a possible arboricultural use. Its			
	origins may extend back further this, and it may			
	represent remains associated with the former village			
1009	Charlton.	Medieval	357942	179983
	A small system of ditches in the north-west corner of			
	Field A. the southern ditch runs east-west for 80 m			
	and is bisected by a present-day track. A north-south			
	running spur runs for 25 m from the southern ditch,			
1010	enclosing the north-west corner of the field.	Undated	357790	179969
	A small ditch feature visible on aerial imagery in Field			
	A, covering an area of 10 m x 7 m. The sides are largely			
	straight and the corners right-angled. The feature			
	appears related to agriculture, possibly representing a			
1011	pen. It is likely to be modern.	Undated	357850	179947



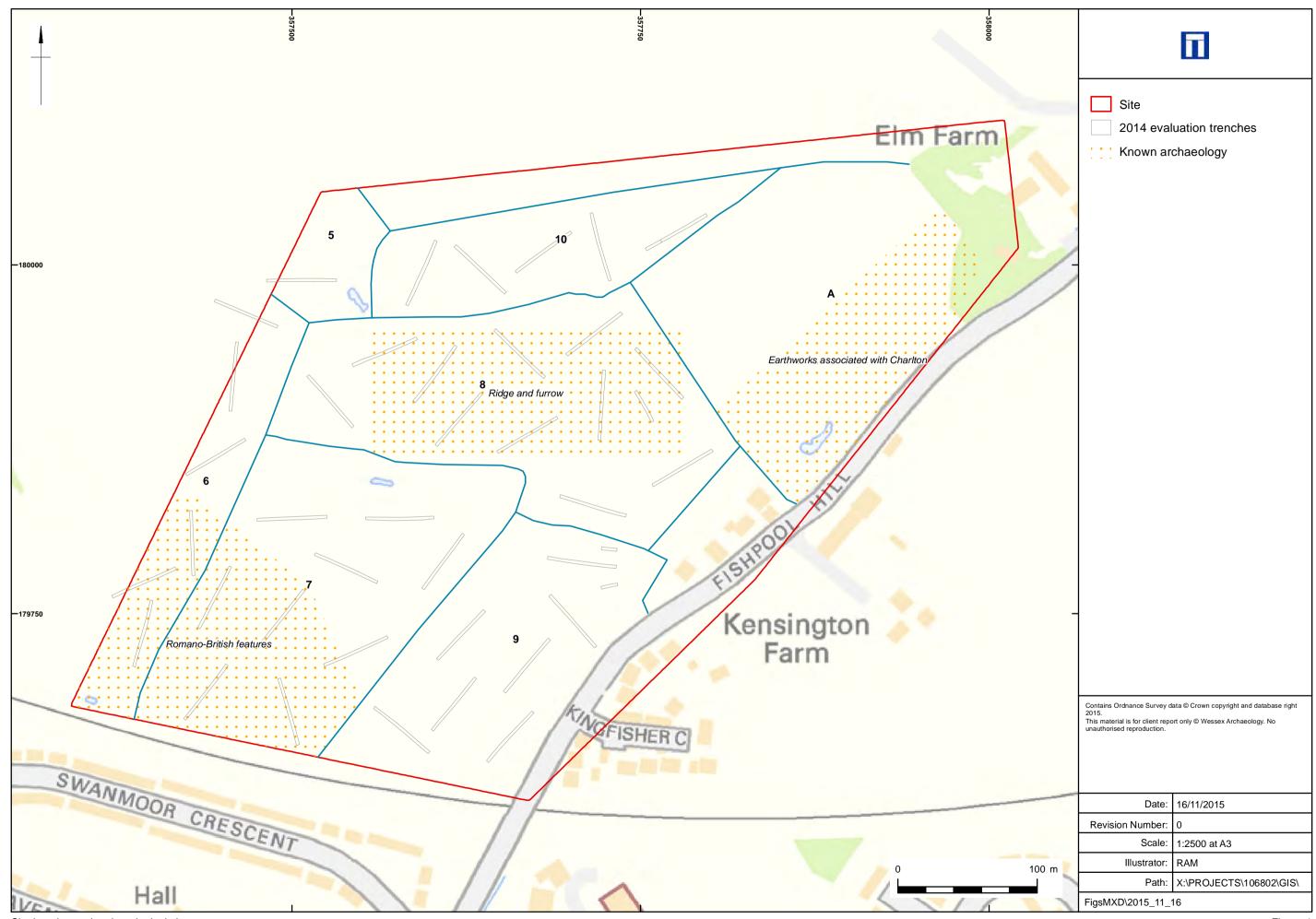
WA No.	Description	Period	Easting	Northing
	A series of banks with in Field A, partly visible on RGB			
	aerial imagery but more so in the NIR. The features			
	are also clear in the DEM-derived datasets. They are			
1012	likely to be related to the former village of Charlton.	Medieval	357909	179944
	A slight, curved ditch in Field A, located between			
	WA1017 and WA1010. It appears related to both of			
1013	these features.	Undated	357809	179944
	A 50 m long, north-south running ditch in Field 8,			
	possibly a southward extension of WA1008. It is			
1014	unmarked on historic mapping.	Undated	357695	179921
	An elongated 'U' shaped ditch in Field A, visible on all			
	datasets. It abuts a modern track and is probably			
1015	related to this.	Undated	357860	179919
	A 65 m x 65 m (at the greatest extent) block			
	containing evidence of agricultural activity in Field 8.			
	The block is less clear in the DEM-derived datasets and			
	is instead most pronounced in the aerial imagery. It			
1016	probably represents remains of ridge and furrow.	Medieval	357718	179917
1017	A slight, 45 m long bank to the south of WA1013.	Undated	357825	179908
	A 60 m long, north-south running bank in Field 8,			
	possibly a northward continuation of WA1028. The			
1018	bank acts as an eastern boundary to WA1019.	Undated	357686	179907
	A 90 m x 65 m block containing evidence of			
	agricultural activity in Field 8, probably ridge and			
	furrow. It is located to the east of an old field			
1019	boundary (WA1021).	Medieval	357654	179897
	A very slight, rectilinear feature is visible on NIR			
	imagery in the west of Field 8. It covers an area 17 m x			
	10 m. It is similar in form to WA1011, suggesting a			
1020	similar use, possibly as a pen.	Undated	357556	179895
	A 100 m long, north-south running bank in Field 8,			
	interrupted by a tree. The bank is slight, but is visible			
	on the DEM-derived datasets. The feature marks the			
	position of a field boundary recorded on the 1841			
	Tithe Map and 1886 OS map, but which had fallen out	19th	0==600	4=0006
1021	of use by the early 20th century.	century	357623	179886
	A 120 m x 85 m block containing evidence of			
	agricultural activity in Field 8. The activity is similar to			
	ridge and furrow in appearance, although less			
	pronounced than both WA1019 and WA1027. The			
	features are located to the west of an old field			
	boundary (WA1021) and are enclosed within the			
1022	bounds of a field marked on the 1841 Tithe Map and	Modiaval	257566	170006
1022	the 1886 OS map.	Medieval	357566	179886
	A 60 m long, east-west running ditch marking the northern extent of there banks recorded on WA1026.			
1023	it is likely to represent remains of the former village of Charlton, possibly a droveway.	Medieval	357842	179879
1023	Chariton, possibly a dioveway.	iviculeval	337042	1/30/3



WA No.	Description	Period	Easting	Northing
	An 80 m long gulley marking the northern boundary of			
	the ridge and furrow recorded as WA1027. It			
	represents the same feature considered to be a			
1024	droveway in the 2014 evaluation.	Medieval	357742	179877
	A slight, 6 m long arced bank in Field 6, possibly an			
1025	area of spoil.	Undated	357457	179871
	Three parallel banks in Field A, appearing to			
	demarcate terraces and abutting WA1023. They are			
	likely to represent earthwork remains of the former			
1026	village of Charlton.	Medieval	357862	179864
	An area of probable ridge and furrow in Field 8,			
	recorded in the 2011 DBA (WA 2011). The features are			
	enclosed within an area measuring 110 m east-west			
1027	and 75 m north-south at the greatest extent.	Medieval	357760	179845
	A 70 m long, 'L'-shaped ditch within Field 8. The			
	feature bounds the area of probable ridge and furrow			
	recorded in WA1027. It may represent an earlier,			
	unmarked field boundary, of which WA1018 may			
1028	represent a northward extension.	Undated	357691	179831
1029	A slight, 45 m long, SSW-NNE running bank in Field 7.	Undated	357490	179822
	An 80 m long circuit of bank within Field 8. It marks			
	the location of a field boundary recorded on the 1841			
	Tithe Map and the 1886 OS map, which had fallen out			
	of use by the early 20th century. Although slight, the	19th		
1030	feature is visible on the DEM-derived datasets.	century	357729	179810
	A 25 m long section of bank to the east of WA1030. It			
	appears related and may mark a section of field	19th		
1031	boundary recorded on the 1886 OS map.	century	357770	179803
	A slight, 6 m long, north-south running, ditch feature			
	visible on the NIR imagery in Field 7. it may be related			
1032	to a modern track.	Undated	357567	179802
	A 160 m long, 'L'-shaped bank within Field 7,			
	representing the remains of an old field boundary			
	marked on the 1841 Tithe map and 1886 OS map. The			
	southern, east-west running section is also recorded	19th		
1033	on the 1903 and 1942 OS maps.	century	357544	179764
	Two parallel banks visible on the NIR imagery in Field			
1034	6.	Undated	357399	179762
	A 65 m long stretch of bank in Field 7, acting as a			
	westwards extension of the southern section of			
	WA1033. The feature is marked on the 1903 and 1942			
1035	OS maps.	Modern	357486	179759
	A 10 m long ditch in Field 7, visible on both the DEM-			
1036	derived datasets and the NIR imagery.	Undated	357385	179738
	A 65 m long bank within Field 7. The feature does not			
	appear on historic mapping and is slight compared to			
	other historic field boundaries. It may be a more			
1037	pronounced ridge related to agricultural activity.	Undated	357645	179717



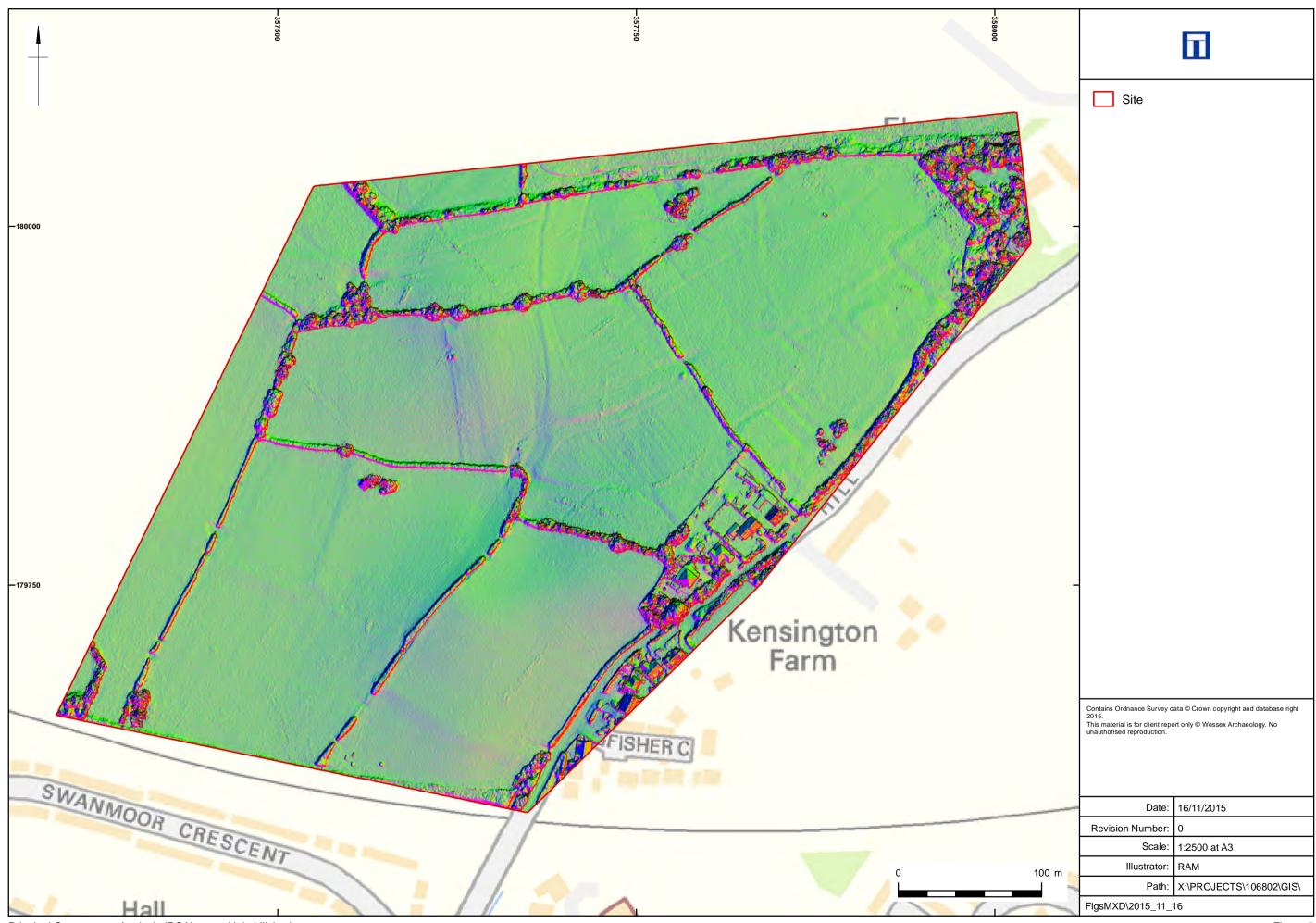
WA No.	Description	Period	Easting	Northing
	A slight 135 m long, intermittent ditch in Field 7,			
1038	possibly related to agricultural activity.	Undated	357493	179703
	A slight 'L'-shaped ditch in Field 7, most clear on the			
1039	NIR imagery. The feature measures 35 m in length.	Undated	357491	179699
	A slight rectilinear enclosure, covering an area			
	measuring 3.5 m x 7.5 m, in Field 7. It is most clearly			
	visible on the NIR imagery. Although n a different			
1040	alignment it may be related to WA1039.	Undated	357471	179663

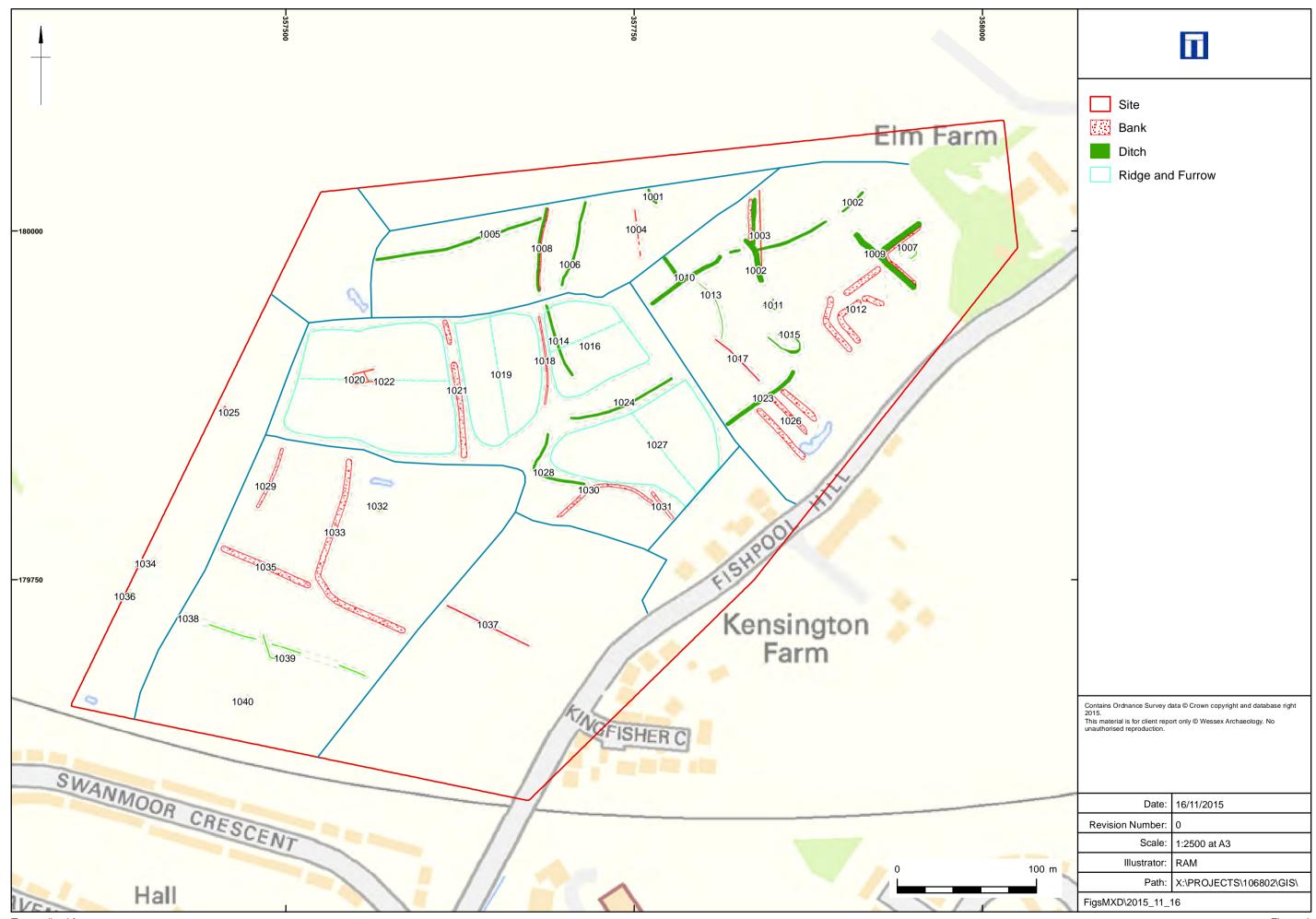












Transcribed features

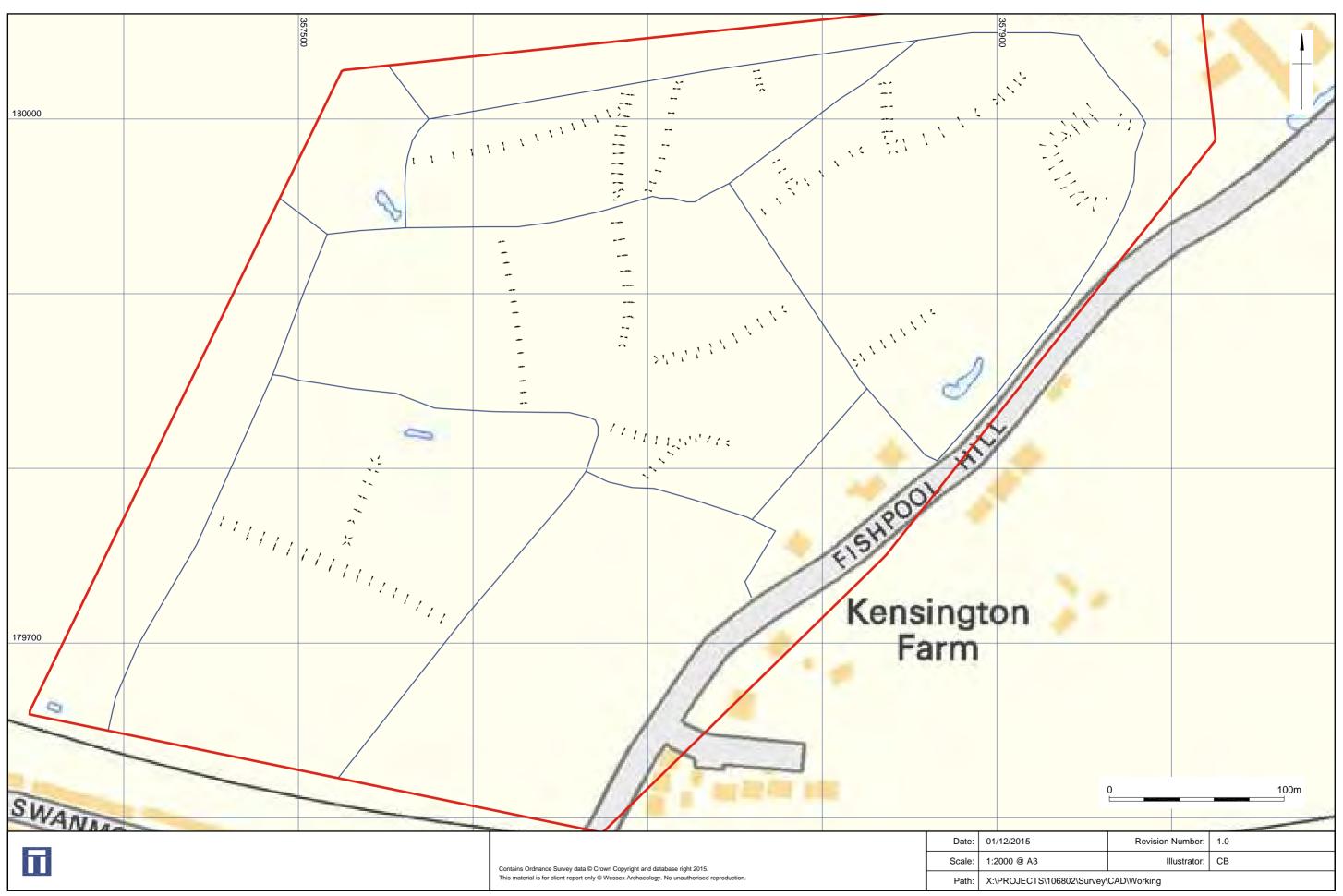




Plate 1: Field 8, looking south-east

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